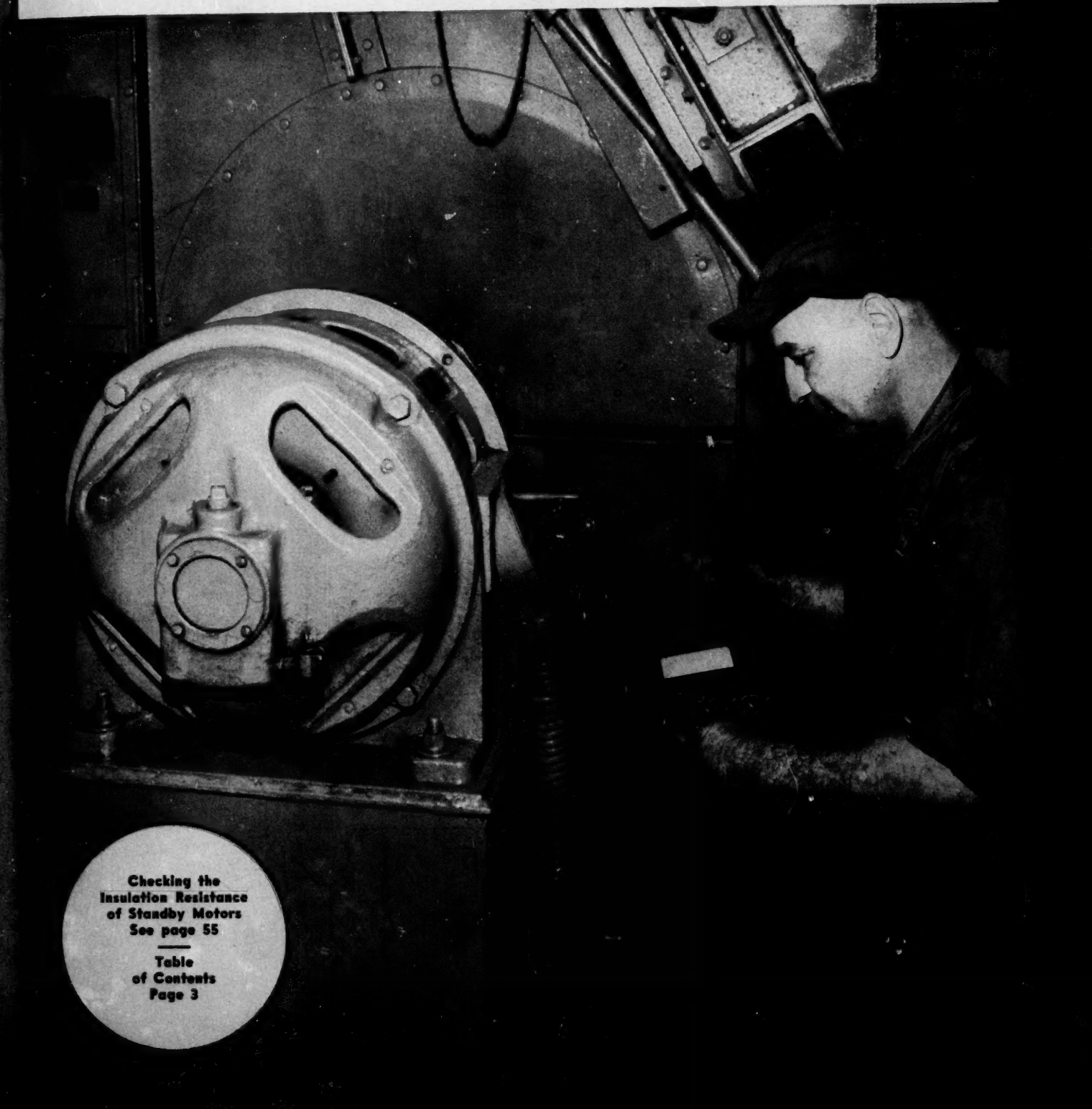
AIR CONDITIONING HEATING AND VENTILATING

JANUARY, 1958—55th Year



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FOR OVER

82

YEARS

WATTS

REGULATOR COMPANY, Lawrence, Mass., U.S.A.

"A Dependable Source of Finest Quality Plumbing & Heating Specialties —"

FOR INFORMATION ON THE LATEST AND MOST MODERN DESIGNS of . . . Pressure Reducing Valves and Regulators—for industrial, commercial, institutional, and residential application.

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VALVES
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REGULATOR COMPANY

When It Comes to Humidification . . .

Here is some information to consider:

Automatic Armstrong Steam Humidifiers give large humidifying capacity at low cost —by discharging clean, dry steam directly into room atmosphere, or into the air stream in ducts or plenums. Control is by accurate humidistats. Connections are made directly into steam supply and return lines, and to 110 or 220 volt electrical circuits.

Pneumatic controls also are available.

Advantages of Armstrong Steam Humidifiers

1. Uniform, Accurate Control. Armstrong Steam Humidifiers give humidity control throughout the room to within 2 to 4% of humidistat setting.

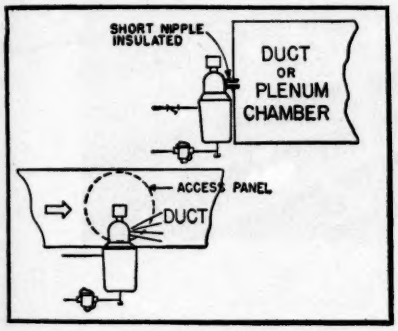
2. No "Fall-out" of Water or Mineral Dust. No water droplets come out of an Armstrong humidifier because the inner chamber is steam-jacketed to evaporate any condensation. And, dry steam leaves no mineral residue to settle out of the air.

3. Easy to Install. Installation of units is similar to that of unit heaters. For simple duct and plenum installations, see Fig. 2.

4. Dependable Quality, Minimum Maintenance. Fan motor bearings are oilless type . . . never need lubrication. Solenoid coils are glass wound. Valves and humidistats are designed for years of service. Simple; sturdy construction means minimum maintenance.

5. Moderate Initial Cost. Mass production and simplicity of design provide a high-quality unit at a moderate price.

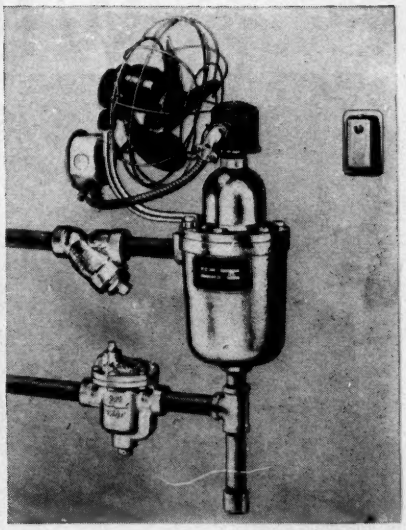
6. Low Operating Cost. The cost of steam for humidification to 50% relative humidity at 70°F. averages no more than 1c per 1000 cubic feet of space for a 24-hour day. And the load on the boiler is no greater than the heating load required to evaporate a water spray. The cost of electricity for the fan is as little as ¼ cent per day where the rate is as high as 3 cents per kilowatt hour.



Duct and plenum chamber installations

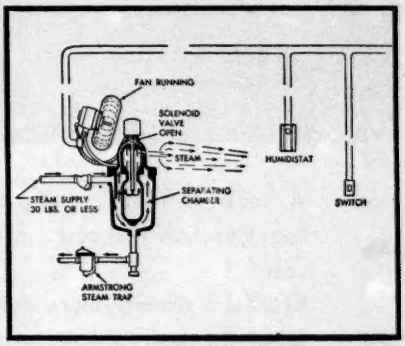
RECOMMENDED HUMIDITIES FOR VARIOUS TYPE ROOMS

Room	*% RH*
Offices, Schools (Health & Comfort)	35-45
Libraries (Protection of Books)	50
Hospital Croup Rooms	90
Static Control	50 or more
Paper Fabricating	40-50
Wood Processing	35-50



HOW THEY WORK

When relative humidity drops slightly below desired level, humidistat activates solenoid valve, which admits steam into separating chamber and thence to room atmosphere. Fan helps disperse steam. When relative humidity reaches desired level, humidistat closes valve and stops fan.



Types Available

ELECTRICALLY OPERATED:

Types C-2 and C-3—These two humidifiers are identical except for size and capacity. The C-2 lists at $170 complete (with fan, humidistat, strainer and steam trap); its capacities for various conditions are listed in the table below. The C-3 (list price $295 complete) has a capacity more than double that of the C-2.

Type VC-2 and VC-3—Similar to C-2 and C-3, but without fans, relying on the velocity of the steam jet for dispersion. At pressures from 5 to 15 lbs. a venturi nozzle is provided. VC-2 lists at $145, VC-3 at $259.50.

Type MC-2—This unit is not automatic, having a manual shut-off valve. List price is $105.25 with venturi, $132.75 with fan.

Type CK-4—A large capacity unit for connection to central heating ducts or large floor-type unit heaters. Automatic humidistat control. Capacity is 6 to 16 times as great as the C-2, depending on pressure. List price is $545.

AIR OPERATED AND CONTROLLED:

Types DA-32, DA-33 and DA-34—just like the C-2, C-3, and CK-4 but with pneumatic humidistats and air-operated valves.

C-2 CAPACITIES

(Maximum cubic feet of space humidified by one Armstrong C-2 Humidifier at 75°F indoor temperature and 0°F, 75% RH outdoors—2 air changes per hour)

Steam Pressure At Humidifier	Humidifier Capacity Lbs./hr.	Relative Humidity To Be Maintained							
		35%	40%	45%	50%	55%	60%	70%	80%
5	42	49,000	43,000	37,000	33,000	30,000	27,000	23,000	20,000
10	60	70,000	61,000	54,000	48,000	43,000	39,000	33,000	29,000
20	65	77,000	66,000	58,000	52,000	47,000	42,000	36,000	31,000
30	76	90,000	77,000	68,000	60,000	54,000	50,000	42,000	36,000

For Details, Prices and Assistance

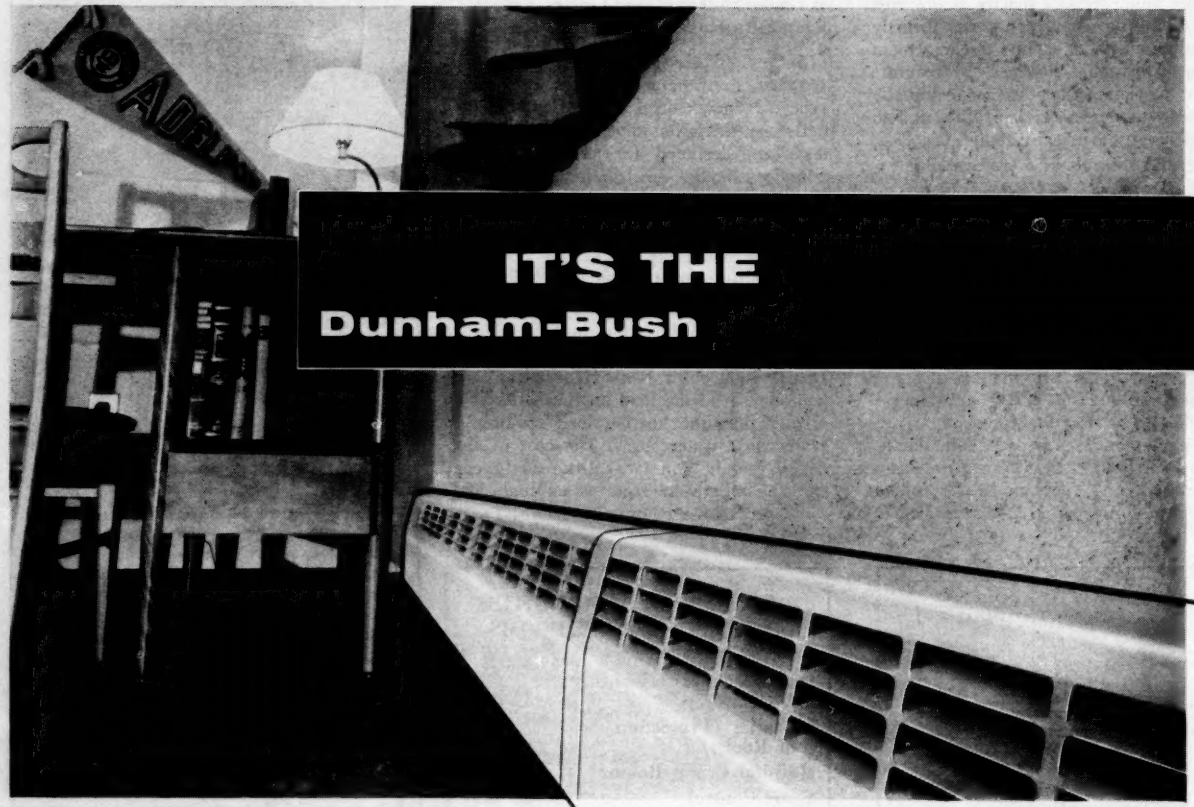
Your local Armstrong Representative will be glad to give you complete details and prices, and help you survey and plan your humidification job—at no cost or obligation on your part. Or you yourself can make the survey, with the help of information given in Armstrong Bulletin 500.

For Complete Information

SIXTEEN-PAGE BULLETIN NO. 500 contains a wealth of information about humidification. Tells: how relative humidity affects products and your profits . . . other effects of relative humidity . . . recommended humidities for various operations . . . advantages of Armstrong Steam Humidifiers . . . how present users have profited . . . complete data and prices on all Armstrong humidifiers . . . selection and installation data. To get your copy, just call your local Armstrong Representative or write

ARMSTRONG MACHINE WORKS
8461 Maple Street
Three Rivers, Mich.

What's "BFOT"?



IT'S THE Dunham-Bush

A "snap" to install . . . all parts snap or fit together. Low first cost . . . low installation cost.

BFOT is a slimmer, more stylish baseboard . . . ideal for wall-to-wall carpeting . . . permits "zone" heating . . . so designed that any cold air from picture windows actually improves heat circulation . . . easily painted to blend with any color scheme . . . no deep air foils to run up painting costs.

You'll want to know more about America's Newest Baseboard. Write for "BFOT" data.

MOVING INTO AIR CONDITIONING? The nearby Dunham-Bush sales engineer can be a big help to you. He's readily available to review the complete Dunham-Bush line of air conditioning and refrigeration products. Your request will bring him your way.

Dunham-Bush, Inc.

WEST HARTFORD 10 • CONNECTICUT • U. S. A.

DUNHAM-BUSH

AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

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AIR CONDITIONING HEATING AND VENTILATING

Volume 55, Number 1 **January, 1958**

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HIGH SPOTS

• A combination of **five cost-reducing techniques** is helping to spur **air conditioning for factories,** announces The Trane Company in a year-end statement. **First,** by holding humidity below standard, factory temperatures may be held above that required in offices. **Second,** air curtains can be incorporated to separate non-conditioned spaces, such as storage spaces, from the conditioned areas. **Third,** ventilating set-ups which remove heat from machines and other equipment and exhaust it, substantially reduce the cooling load. **Fourth,** spot cooling, where needed only, permits ignoring of non-inhabited areas. **Finally,** designs keyed to air condition only the working zone, that 10 to 12 feet of space directly above the floor, can take advantage of the fact that cold air stays down.

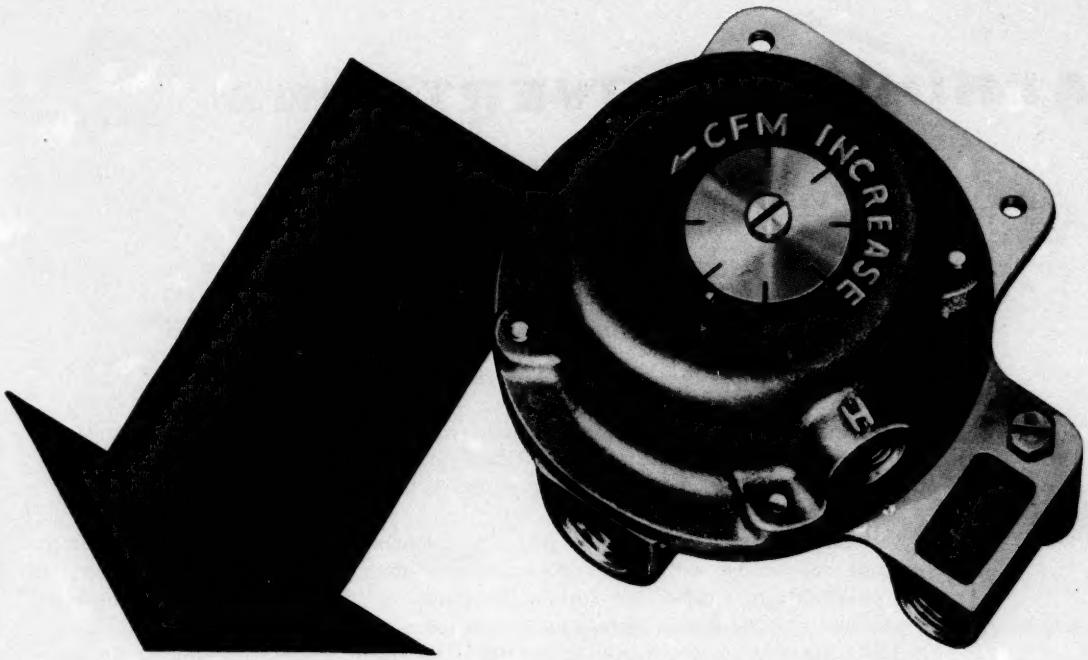
• Mechanical refrigeration, and its offspring, **air conditioning,** became more firmly entrenched as **integral parts of life in America** during 1957, says Air Conditioning and Refrigeration Institute, Washington, D. C., in a year-end statement. While sales of residential air conditioning did not reach the predictions made earlier in the year, they were above any year prior to 1956. Cool weather is held partly to blame. However, installations in commercial and industrial establishments continued to climb. Heat pumps are expected to become a larger factor in the production of many companies this year. Further inroads of gas and oil-fired cooling systems are predicted.

• Report No. 27 to the Federal Construction Council has been completed by the Building Research Advisory Board and distributed to the government agency members of FCC. The report, which has also been approved for future publication by Building Research Institute (BRI), analyzes the various types of **underground piping systems** available, and correlates their use to soil and moisture conditions.

• A new member of the family of thermoplastics, ready to serve the piping industry, was shown at the 26th Exposition of Chemical Industries in New York's Coliseum in the form of a **Y-globe valve.** Called **polypropylene,** the plastic is being developed independently by Hercules Powder Company and an Italian firm, Montecatini. With strong pressure-temperature relationships up to 300 deg. F., the plastic is seen as having a future in **medium and high temperature water heating.** However, it is reportedly not as highly corrosion resistant as the lower-temperature-rated polyvinyl chloride.

• The Association for Applied Solar Energy awarded first prize ($2,500) in its **International Solar House Architectural Competition** to Peter R. Lee, senior student in architecture at University of Minnesota. Outstanding feature of Lee's design, according to Dean Pietro Belluschi of MIT, chairman of the jury, was the logic of its solar equipment, which acts in the double capacity of shade louvers in the summer and heat collector in the winter. The prize-winning house will be built on an irrigated desert site north of Scottsdale, Ariz., and will be put on public display in the spring of 1958. Its solar collectors will be used to heat the house, to heat domestic water, and to warm the swimming pool which is an integral feature of the design.

• A new **Four Corners District of American Society for Testing Materials** (ASTM) is planned for the four states of New Mexico, Arizona, Utah, and Colorado. A technical session with outstanding speakers is promised for the twenty-seventh of this month. All interested engineers and materials personnel are invited. Information may be had from J. L. Abbott, 1902 Richmond N.E., Albuquerque, N.M.



JOHNSON *AIR FLOW* CONTROLLER FOR HIGH VELOCITY, DOUBLE DUCT SYSTEMS

- **Provides Positive Constant Volume Control**
- **Eliminates Costly Manual Balancing**
- **Designed for Leading Makes of Mixing Units**

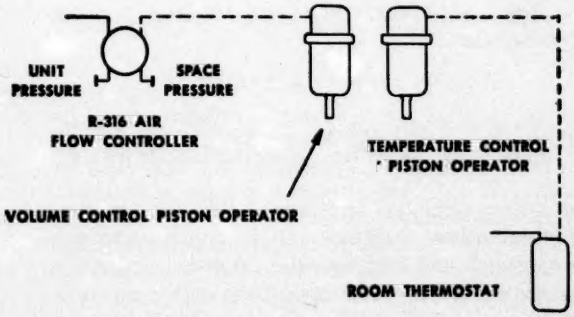
The Johnson R-316 Air Flow Controller for high velocity, high pressure, double duct air conditioning systems provides accurate, constant volume air distribution through every unit in the system, regardless of the number of mixing units, length of duct runs or differences in pressures between the hot and cold ducts.

With the R-316, comfort is complete, uninterrupted. There are no variations in sound levels. You completely eliminate costly and difficult manual balancing. Systems remain in perfect balance at all times.

The power source of the R-316 is taken from the filtered, dehumidified control air supply system. The use of this air power source eliminates problems arising from residual dirt in the duct distribution system and dirt-contaminated duct air. Moreover, it allows the static pressure of the air distribution system to be maintained at the minimum pressure required for proper air distribution, without the necessity of maintaining a higher pressure for instrument operation. *This is an important economic factor in initial fan cost, fan horsepower consumption and duct design.*

The R-316 operates at any pressure difference from approximately 0 to 1 inch wg and will produce a 1 psi air pressure change on pressure difference changes of less than .005 inch wg.

If your plans call for high velocity, double duct air conditioning, a Johnson Pneumatic Control System with provision for constant volume control will help you produce incomparable results. Ask your local Johnson branch for complete details or mail the coupon.



Typical temperature-volume control arrangement for a high velocity mixing unit. R-316 Air Flow Controller insures delivery of a constant volume of air, compensates perfectly, *instantly*, for variations in inlet pressure of hot and cold air supply.

JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

JOHNSON SERVICE COMPANY

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Please furnish details on your new R-316 Air Flow Controller.

Name_____

Company_____

Address_____

City & State_____

WASHINGTON OVERTONES

by LORING F. OVERMAN

● Washington prepared for the January return of the 85th Congress amid a jangling of conflicting overtones:

—Two USSR sputniks and one USA satellite failure were disconcerting.

—Presidential health reports were not reassuring.

—Election-year strategy was being "jammed" by emergency signals.

—Business was reacting strangely, erratically.

Particularly disturbing to Washington was the return of a sense of urgency, of possible crisis. Observers recalled that on several previous occasions the capital's wish "to settle down to a long winter's nap" has been rudely awakened by a need to "look alive".

Although Washington expects no "Pearl Harbor", either here or over there, present happenings do sound one extremely clear overtone. They drown out the possibility that either the nation, the states, or big-or-little business can carry on without having their "management sets tuned closely to national capital".

For some time to come politics-as-usual and business-as-usual will be strangers to the 85th Congress, Second Session, and to the 1958 market place.

● Sputnik scare is considered by some observers as made-to-order smoke screen "for advancing every type of government expenditure".

Economizers within government concede the need for stepped-up defense projects. But they urge planners to start with available tax revenues, and to divert needed funds from the maybe groups to the must-do fields.

Under such a plan, next year's budget might be earmarked to provide an extra billion or so for missiles, and one or more for foreign aid, by trimming non-emergency expenditures.

Realists find it difficult to conceive of any government agency giving up a part of its present revenues, to DOD or to anyone else, without battling all the way back to the grass roots.

Optimists feel that "he who fills the ballot box rules the Congress". Hence those up for election and reelection will be charged to budget with care.

Meanwhile the Administration has recommended that present corporate income tax rates be continued at 52%, and that Korean war excise levies remain unchanged. Both were scheduled for changes June 30, 1958—excises to be eliminated and corporate rates to drop to 47%.

Arguments for tax economies and for changes in the overall taxing structure will be given a thorough airing for a month, starting January 24, before the House Ways and Means Committee. By December 2, deadline for receiving requests to testify before the committee, 300 had asked for time to tell their stories.

Tax economy groups, including U.S. Chamber of Commerce and National Association of Manufacturers, are urging members and others to keep pressing for government economies and tax reductions.

● Despite uncertainties in some business and government fields, the outlook for the heating, ventilating and air conditioning industries is extremely favorable. As affected by Washington:

—Astronautics, the conquest of space, open up vast new fields for air conditioning and refrigeration. In manufacturing processes and in control and operation of many of the new weapon systems and components, extensive and revolutionary humidity control facilities are involved. The opportunities for air conditioning and refrigeration in astronautics are as new as the field itself, and as limitless.

(Continued on page 8)

This Might Be All The Heating Plant Needed To Keep The Barn (Or a House) Warm!

A cow or horse produces 1800 to 3700 Btu's an hour. Human beings are also heat producers, 300 to 750 Btu's an hour. The trick is to keep the barn or house from *losing* heat. Scientific multiple aluminum drastically retards heat loss from buildings in winter, and heat flow inward in summer.

Where buildings for *human* occupants are heated, cutting down heat loss is vital. Health and comfort are involved, as well as the money spent on fuel and heating equipment.

Type 9, 9 rectangular, aluminum, reflective spaces, equals 7¾" of non-metallic insulation for UP-HEAT FLOW, 11¼" for DOWN-HEAT FLOW.

Two, inexpensive, tough outer sheets made of aluminum laminated to fiber plus a center layer of foil, all ⅞" apart, comprising 4 rectangular-shaped, joist-to-joist reflective spaces, create the following insulation equivalents:

UP-HEAT - - - 3⅕" non-metallic insulation† (C .105)*
WALL-HEAT - - 4⅘" non-metallic insulation† (C .068)*
DOWN-HEAT - 8" non-metallic insulation† (C .042)*

WHY MULTIPLE ALUMINUM IS EFFECTIVE

Its aluminum surfaces have a heat ray reflectivity of 97%; absorptivity and emissivity of only 3%. In addition to reflecting heat by Radiation, which accounts for 50% to 93% of all heat flow across building spaces depending on direction, the layers of aluminum, fiber, and air-spaces retard Convection or movement of warm air. The layers of low density air spaces have slight Conduction. The aluminum layers, long and *continuous*, are almost impervious to water vapor. Infiltration under flanges is slight.

Condensation on or within this insulation is minimized by the scientific construction of multiple, joist-to-joist aluminum and air spaces.

Answers to problems of insulating of farm, residential, commercial and industrial buildings are readily available. The subject is among those interestingly discussed by Alexander Schwartz in "Heat Flow by Radiation in Buildings." It is yours for the asking. Use coupon.

THERMAL VALUES*, INFRA RECTANGULAR INSULATIONS
Non-metallic Insulation Equivalents†

	UP-HEAT	DOWN-HEAT	Cost, Installed§
TYPE 2	C .177=1⅘"	C .064=5⅓"	5¢ sq. ft.
TYPE 3	C .142=2⅓"	C .049=6¾"	6¢ sq. ft.
TYPE 4	C .105=3⅕"	C .042=8"	8¢ sq. ft.
TYPE 5	C .081=4"	C .034=9⅓"	10¢ sq. ft.
TYPE 6	C .068=4⅘"	C .034=9⅓"	11¢ sq. ft.
TYPE 9	C .043=7¾"	C .029=11¼"	16¢ sq. ft.

Types 1, 7, 8 also available

*Determined by method of National Bureau of Standards in H.H.F.A. Research Paper 32.
†Calculated on basis of limiting thermal values cited in Fed. Specs. LLL-f-321b; HH-I-585; HH-I-521c; HH-I-551a.
§Approximate cost, material and labor, new construction between wood joists.

CAN BE PURCHASED THROUGH YOUR PREFERRED LOCAL DEALER

Infra Insulation Inc., 525 Bway., N. Y., N. Y. Dept. V-1
Please send "Heat Flow by Radiation."

NAME_____
FIRM_____
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ADDRESS_____

WASHINGTON OVERTONES *(Continued from page 6)*

—Smoother sailing for central air conditioning in residences is forecast by easing of Federal Housing Administration regulations. The new viewpoint permits the cost of central air conditioning to be included when evaluating property for loans to be guaranteed by FHA. In addition to permitting air conditioning in homes financed under FHA regulations, the change is expected to hasten the acceptance of such installations as an essential part of all modern home construction.

—Another Washington triumph for air conditioning was the government-industry symposium conducted by the U.S. Commerce Department. At that meeting, government spokesmen gave air conditioning an almost-official blessing. Industry spokesmen pointed out the economic advantages of air conditioning from the standpoints of employee efficiency, and materials and process control. Government men, in turn, indicated that virtually all future government buildings will be air conditioned.

● Besides contacting government, the air conditioning industry looks to Washington as headquarters of the Air Conditioning and Refrigeration Institute. ARI's Managing Director, George S. Jones Jr., offers industry members reason for optimism:

—"Our industry has had an outstanding decade; the next ten years will see even greater growth and impact on our life and economy", he forecasts. "The potential is there; the industry is ready technique-wise, and the users are rapidly converting what we used to think of as 'public-acceptance' into 'public demand'.

—"Within the next decade the non-air-conditioned home will become as obsolete as is the home today without a central heating system; workers in virtually all fields will do their daily stints in air conditioned surroundings, and will travel to and from work in air conditioned automobiles. Mechanical refrigeration will become increasingly necessary for the processing and distribution of our food as civilization becomes more complex and new types of food are developed".

● Further encouragement for heating, ventilating, and air conditioning industries can be found in Washington reports that home building totals keep pushing the million-a-year annual rate. Private housing starts for November were at the annual rate of 1,010,000. The figure was one percent above the October rate of 1 million, and 8% above the March low of 933,000. The rate, however, was 2% below November of 1956.

Continued formation of new households at the rate of 1,000,000 a year keeps up the demand for housing, although prices sometimes take prospects out of the market. Increasing interest in apartment construction in 1958 is forecast.

● Air conditioning and refrigeration people interested in the expanding defense program may have noticed that the Small Business Administration is now represented on the Defense Mobilization Board. The Board coordinates policies and activities of principal departments and agencies participating in the defense program. Wendell B. Barnes, Small Business Administrator, represents that agency on the DMB.

● National Bureau of Standards has issued a summary technical report on building material research showing that air spaces in buildings give better insulation if they are surfaced on one side, or subdivided, with highly reflective surfaces such as aluminum foil. The report (BMS 151), "Thermal Resistance of Air Spaces and Fibrous Insulations Bounded by Reflective Surfaces", is available at 15 cents per copy from Superintendent of Documents, Government Printing Office, Washington 25, D. C.

The self-fluxing nature of wrought iron enables this welder to easily produce sound, durable welds along these chilled water lines at new Fireman's Fund Building in San Francisco.

Wrought Iron adds piping permanence to new Fireman's Fund Insurance Building

The new $4½ million glass-walled home office of the Fireman's Fund Insurance Company is piped for permanence.

Designers made sure of this when they specified wrought iron pipe for condenser water and chilled water lines for air conditioning, and for underground steam lines, steam condensate lines, underground gas lines and downspouts.

Wrought iron's thrift over ordinary piping materials stems from a property feature—thousands of glasslike iron silicate fibers entrained in the pure base metal. This defense against corrosion is unique with wrought iron. No other material can duplicate it. And it pays off in low cost per-year-of-service.

If you have an installation problem or need fabrication data on wrought iron, write our Engineering Service Department for help. A. M. Byers Company, Clark Building, Pittsburgh 22, Pennsylvania.

New Home Office Building, Fireman's Fund Insurance Company
Architect: Edward B. Page
Mechanical Engineer: R. Rolleston West
General Contractor: MacDonald, Young & Nelson

BYERS Wrought Iron Tubular and Hot Rolled Products

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS

Corrosion costs you more than Wrought Iron

BRIEFLY STATED

FOR THE FILES—A major tenant in the new 666 Fifth Avenue building, New York City, is FOSTER WHEELER CORPORATION, international construction and engineering firm. Second largest of the city's postwar skyscrapers, the Tishman building has electronically-guided elevators said to almost eliminate waiting time, movable interior steel walls, and 3,000 tons of York induction air conditioning.

WITH THE INSTITUTES AND ASSOCIATIONS—Charles L. Walling, Los Angeles, was nominated and elected president on the first ballot during the 1957 convention of REFRIGERATION AND AIR CONDITIONING CONTRACTORS ASSOCIATION NATIONAL (RACCA). First vice-president is Armand Cowan, Miami, Fla., and second vice-president is Lee J. Quinn, Cincinnati, Ohio . . . At the closing session of its 62nd annual convention, at which more than 300 building contractors attended, Leon L. Munier, president of Wolff & Munier, New York City, was elected president of BUILDING INDUSTRY EMPLOYERS OF NEW YORK STATE . . . Officers of AIR MOVING AND CONDITIONING ASSOCIATION, INC., (AMCA) for 1958: James W. Wilcock, general sales manager, Sturtevant Div., Westinghouse Electric Corp., Hyde Park, Mass., president for one year; R. A. Wasson, vice-president and general manager, Clarage Fan Co., Kalamazoo, Mich., and L. A. Macrow, manager of Systems & Equipment Dept., Machinery & Systems Div., Carrier Corp., Syracuse, N. Y., as well as W. H. Rietz, president of Ilg Electric Ventilating Co., Chicago, Ill., are vice-presidents for 1958. J. J. Merrick, division sales manager, John J. Nesbitt, Inc., Philadelphia, Pa., will serve as secretary-treasurer. Marshall F. Allen is appointed executive vice-president. As chief staff member, he will administer all AMCA plans and activities from headquarters in Detroit. Albert S. Sheppard, who comes from Chrysler Corporation, is appointed staff engineer, concerned primarily with the fan performance rating certification. Robert K. Guy, from Perfection Industries Div., Hupp Corporation, is assistant to the executive vice-president . . .

During the past year, its interests have broadened to include 85% magnesia, calcium silicate, expanded silica, and diatomaceous silica insulations for hot piping and equipment, so its new name is now MAGNESIA-SILICA INSULATION MANUFACTURERS ASSOCIATION, New York, N. Y. . . . Lewis W. Berger, research metallurgist, is appointed training supervisor of the rapidly expanding METALS ENGINEERING INSTITUTE of the AMERICAN SOCIETY FOR METALS, Cleveland, Ohio . . . J. W. McAfee, president of Union Electric Co., St. Louis, Mo., is the new president of EDISON ELECTRIC INSTITUTE, New York, N. Y. and J. E. Corette, president of The Montana Power Co., Butte, Mont., is vice-president . . . Meeting Monday and Tuesday of this month in the Waldorf-Astoria, the 45th annual meeting of the COMPRESSED GAS ASSOCIATION, INC., will include special addresses, technical papers, and wind up with a banquet . . . Reporting for the 1956-57 fiscal year, ARMOUR RESEARCH FOUNDATION of ILLINOIS INSTITUTE OF TECHNOLOGY, Chicago, Ill., says its gross volume was 2 million dollars over the preceding year, reflecting 404 projects for industry and 330 for government . . . Milton C. Coon, Jr., has been appointed secretary of BUILDING RESEARCH INSTITUTE, Washington, D. C. He replaces Hal C. Farrell, who submitted his resignation.

The ORR & SEMBOWER, INC. Traveling Service School, said to be unique in its operation, has been conducted this past fall in parts of Latin America, bringing its representatives there the same late technical information that its domestic representatives have.

BURGEONING BUSINESS—Effective January 1, IRON FIREMAN MFG. CO., Cleveland, Ohio, will handle all national sales and service of the line of residential heating and cooling equipment of the H. D. CONKEY & CO., Mendota, Ill. No corporate merger is involved . . . Addition of 40,000 sq ft to the CHICAGO BLOWER CORPORATION plant in Franklin Plant, Ill., has doubled its production capacity . . . A wholly owned subsidiary to be known as ARMSTRONG CONTRACTING AND SUPPLY CORPORATION is being formed by Armstrong Cork Co., Lancaster, Pa., to handle all contracting operations now carried on by its Insulation Division. It will be headed by J. W. Liddell as president . . . With expansion of the original Siegler Corporation, Anaheim, Calif., from purely a space heating manufacturer to one primarily engaged in the field of electronics, it has established a separate division for its Centralia, Ill., space heating operation to be known as the SIEGLER HEATING COMPANY . . .

For the first time in its 47-year history, DRAYER-HANSON, Los Angeles, Calif., now a division of National-U.S. Radiator Corporation, there is no seasonal factory layoffs over the season's holidays, the proud management announces . . . The WAGNER ELECTRIC CORPORATION recently expanded its St. Louis plant by more than 28,000 sq ft with the addition of a new manufacturing building to meet its need for increased facilities on its present property . . . UTILITY APPLIANCE CORP., Los Angeles, Calif., will market all its products under the single name of GAFFERS & SATTLER.

AMONG THE MANUFACTURERS' PERSONNEL—Edgar W. Wright, Jr., is appointed district represen-

(Concluded on page 12)

Harold M. Hecker, publications, announces the formation and incorporation of the NEW YORK ASSOCIATION OF CONSULTING ENGINEERS, INC., 2507 James St., Syracuse. To date, the state-wide association consists of chapters in Western New York, Central New York, and Rochester. Officers elected to serve until July, 1958, are: Howard F. Eckerlin, president and director; James N. DeSerio, vice-president and director, Frank E. Kulas, secretary-treasurer and director; Realto E. Cherne, director; Paul Robson, director; and Donal Brill, director. Membership is restricted to chapters whose members are consulting engineers in private practice.

And in Chicago — A FUTURE OF FAULTLESS SERVICE

ADMINISTRATION and LABORATORY BUILDING & MANUFACTURING PLANT
AUTOMATIC ELECTRIC COMPANY
Northlake, Illinois
THE AUSTIN COMPANY
designers, engineers and builders
ECONOMY PLUMBING & HEATING CO.
plumbing contractor
WARREN BARR SUPPLY CO.
wholesale distributor
CRANE CO.
plumbing fixtures manufacturer

Framed in a gently rolling country club setting 15 miles Northwest of Chicago's Loop is this newest addition to the DELANY family of prestige installations . . . a manufacturing unit of the General Telephone System and one of the largest industrial buildings in Mid-America. A single 35 acre roof sheltering 10,000 employees, formerly housed in 17 multi story buildings, indicates the immensity of the structure.

Containing its own police and fire departments, a medical center, a bakery, and extensive dining facilities, the high standards of design are evident in details everywhere. In 41 gleaming ultra modern washrooms . . . each one a model of sanitation . . . nearly 700 DELANY diaphragm type FLUSH VALVES were selected to provide the attractive styling and unflagging service that such a carefully planned project deserves. Confidence in DELANY has made DELANY—"the fastest growing name in flush valves!"

DELANY FLUSH VALVES LEAD THE FIELD IN PRODUCT DESIGN AND DEVELOPMENT

One of the most advanced examples of superior design is the exclusive "Rubberflex" handle unit . . . standard on all Delany Flush Valves. Utilizing a wall of rubbers to seal off the possibility of leakage through the handle . . . the "Rubberflex" greatly reduces one of the most common complaints of flush valves. Containing four parts, the "Rubberflex" handle is entirely springless and packless.

COYNE & DELANY CO. • 834 KENT AVE. • BROOKLYN, NEW YORK

IN CANADA: THE JAMES ROBERTSON CO., LTD.

DELANY *Flush* **VALVES**

Since 1879

BRIEFLY STATED

(Concluded from page 10)

tative to cover the District of Columbia, Virginia, Maryland, North Carolina, and Eastern Tennessee for AMERICAN-STANDARD AIR CONDITIONING DIVISION, New York, N. Y. . . . New vice-president for sales, L. J. WING CO., division of AERO SUPPLY MFG. CO., INC., Linden, N. J., is Theodore R. Pyrek . . . Lloyd D. Wasson is named general manager of packaged products for all franchised branches and subsidiaries of YORK CORP., York, Pa., subsidiary of BORG-WARNER . . . Dr. Donovan E. Kvalnes, technical manager of DU PONT'S FREON PRODUCTS DIVISION, Wilmington, Del., assumes additional duties as the division's sales development manager, replacing Dr. Edmond G. Young who is named manager of development conferences in the Marketing Research Division of the company's Development Department . . .

YORK CORPORATION named Robert G. Werden general sales manager of engineered equipment, in charge of all engineered air conditioning and refrigeration equipment in this country. Walter L. Pharo takes the title of general sales manager of contract products, which involves sales of special products not directly related to the air conditioning and refrigeration industries. M. S. Lebair became assistant vice-president of marketing. As staff assistant to Austin Rising, director of marketing, his specialty will be trade relations . . .

Robert P. Stuntz is now assistant sales manager of Refractories Div., THE BABCOCK & WILCOX CO., New York, N. Y., and succeeding him as manager of the division's Chicago district office is Robert H. Forsyth . . . To the position of government services representative, BARBER-COLMAN CO., Rockford, Ill., has appointed Roy Hardy, who will be found at the company's Washington, D. C. office in Bethesda, Md. . . . Managing engineering and development for UNITED STATES AIR CONDITIONING CORP., Philadelphia, Pa., is William C. McMichael. He was chief engineer of Bryant Air Conditioning Corporation . . .

Alfred C. Buensod, 71, who was chairman of the board of Buensod-Stacey, Inc., New York, N. Y., died after an illness that had persisted over the past year. He became involved in air conditioning when, after graduation from Stevens Institute of Technology in 1907, he joined the International Cigar Machinery Corp., a subsidiary of American Machine and Foundry Co., in Brooklyn, and was concerned with the application of air conditioning to maintain the proper regain in tobacco while being processed in the cigar machines. In 1915 he joined Carrier Engineering Corporation, continuing to specialize in the tobacco field. He left Carrier in 1935 to form Buensod-Stacey. He was a life member of the American Society of Mechanical Engineers and the American Society of Heating and Air-Conditioning Engineers.

P. F. Canavan, Jr., is named vice-president and general manager of CONNOR ENGINEERING CORP., Danbury, Conn. He has been production manager . . . John P. Carr is named assistant manager of Central Div., the WALWORTH CO., New York, N. Y. He will be in Pittsburgh, supervising operations in West Virginia, sections of New York, Pennsylvania, Maryland, Ohio, Kentucky, and Indiana . . .

The following appointments have been announced: A. S. Chalfant, director of steel sales, A. M. BYERS COMPANY; J. M. Newlon, Jr., manager of NATIONAL-U. S. RADIATOR CORPORATION'S Atlanta, Ga., branch; George Senseney, director of engineering at the Portland electronics and heating controls plant at IRON FIREMAN MANUFACTURING COMPANY; Glen R. Everett, factory sales representative for Northeastern Ohio and Western Pennsylvania for THE DEMING COMPANY; Harry J. Watson, manager of THE TRANE COMPANY service department; H. Wells Williams, consultant for Engineering and Research Department, and E. S. Spangler, manager of heating elements engineering, NATIONAL-U. S. RADIATOR CORPORATION; Maurice Nelles, vice-president for engineering, and Paul S. Kempf, vice-president for personnel and industrial relations, CRANE COMPANY; P. F. Bauer, vice-president and managing director, Allis-Chalmers International, E. J. Mercer, vice-president and general manager, Construction Machinery Division, and William M. Wallace, vice-president and general manager, General Products Division, all of ALLIS-CHALMERS MANUFACTURING COMPANY; David W. Hoppock, vice-president and general sales manager, BRYANT MANUFACTURING COMPANY, a Carrier division.

NEW REPRESENTATIVES AND DISTRIBUTORS —Representing FARR CO., Los Angeles, Calif.; Brownlee-Morrow Company, covering Alabama; Earl W. Siebert, Northern Florida and Southern Georgia; Robert S. Belcher, Central Florida; and G. H. Avery Company, in Arkansas . . . There's a new AMERICAN BLOWER branch office in Amarillo, Tex., with F. L. Matthews in charge, the American-Standard division announces . . . Pirmacs Distributors, Buffalo, N. Y., is franchised to distribute room air conditioners and dehumidifiers manufactured by FEDDERS-QUIGAN CORP., Maspeth, N. Y. . . . Representing TRION, INC., McKees Rocks, Pa.: H. E. Rieckelman Co., Buffalo, N. Y., and Robert S. Belcher, Tampa, Fla. . . . Hillside, Ill., boasts a new warehouse and sales office of FLEXIBLE TUBING CORP., Guilford, Conn. . . .

The newly-formed firm of Case-Orians Co., Detroit, Mich., are the Eastern Michigan representatives for MCQUAY, INC., Minneapolis, Minn. . . . Realignment of the sales and distribution structure of DRAYER-HANSON in Florida splits the territory three ways among sales agents Henry G. Graham, Tampa, Sanders & Hollander, Miami and Miami Beach, and Earl W. Seibert, Ponte Vedra Beach . . . The A-C Supply Co., Philadelphia, Pa., will distribute STURTEVANT DIV., WESTINGHOUSE CORP., fans and unit heaters in the eastern half of Pennsylvania and most of Delaware and New Jersey . . . In Michigan, Star Steel Supply Co., Detroit, will handle GENERAL ELECTRIC AIR CONDITIONING DIVISION commercial and industrial packaged units.

another TUTTLE & BAILEY...

CASE HISTORY

JOB: Air conditioning existing 34-story building* in New York City

NO. AIR OUTLETS FURNISHED:
3729 T&B grilles, registers and diffusers

% OF STANDARD SIZES: 98.9%

Average shipping time: 4 DAYS

Almost 99% of the Tuttle & Bailey Air Distribution Devices specified for this major remodeling job were shipped an average of *four days* after release orders were issued. Individual orders were received at the factory over an eleven month period and ranged in quantity from two pieces to more than two hundred.

This outstanding case history is further proof that when T&B outlets are specified in *standard warehouse sizes*, you can count on almost immediate delivery which gives you the advantages of better scheduling, less wasted time and faster completion of the job. On modernization work, these advantages add up to minimum disturbance for tenants.

Whether your next air distribution job is in a new or existing building, large or small, it will pay you to look into the time-saving benefits of Tuttle & Bailey *standard warehouse sizes.*

For the facts, see your T&B Representative or write us direct.

TUTTLE & BAILEY

division of Allied Thermal Corp. New Britain, Connecticut

*Name of building on request

A complete line of air distribution equipment and accessories for low and high pressure systems.

SCIENTIFIC FRONTIERS

● Scientists at Federal Reclamation Bureau's Denver laboratory assert that tests have shown a chemical coating can be used to reduce significantly the evaporation of water at small reservoirs. They are hopeful large-scale tests, planned for 1958, will prove this also can be done, under economically feasible treatment, to larger bodies of water. The chemical, hexadecanol, will not adversely affect the quality of water it saves from evaporation.

● The United States Atomic Energy Commission executed a fixed-price contract of $9.9 million with The Babcock & Wilcox Company to furnish the basic propulsion system, including the reactor and components of the steam plant and auxiliary systems, for the first nuclear-powered merchant ship, the *N.S.* (nuclear ship) *Savannah*. This power plant will deliver 20,000 shaft horsepower and is expected to be completed in early 1960. The ship's name honors the *S.S. Savannah*, the first ship with steam propulsion to cross the Atlantic.

● The Office of Saline Water is preparing an ocean site at San Diego for the setting up and testing of an experimental solar still. Purpose of the tests is to determine night radiation losses and to develop means of reducing them before proceeding with construction of a larger fresh water generator. Other efforts in this direction include compression of ice made from salt water which, according to a team of Navy-sponsored researchers led by E. N. Kemler of the University of Minnesota, appears to be the most promising mechanical method of removing salt to get fresh water. Pressure put on the salty ice effectively squeezes out the greatest portion of the salt as a dense brine.

● A new technique for converting heat directly to electricity without using moving parts was described by scientists of General Electric Research Laboratory in Schenectady. A *thermionic converter*, consisting of two electrodes, one relatively cold and the other exposed to a heat source, removes barriers which in the past have absorbed the energy before it could do useful work in an electric circuit. Electrons are emitted from the hot to the cold electrode through a low pressure gas, and are conducted through a wire out of the converter as electricity. Converter, now operating at efficiency of 8% as compared to a thermocouple's 1%, is hoped ultimately to be able to change 30% of input heat energy into electricity.

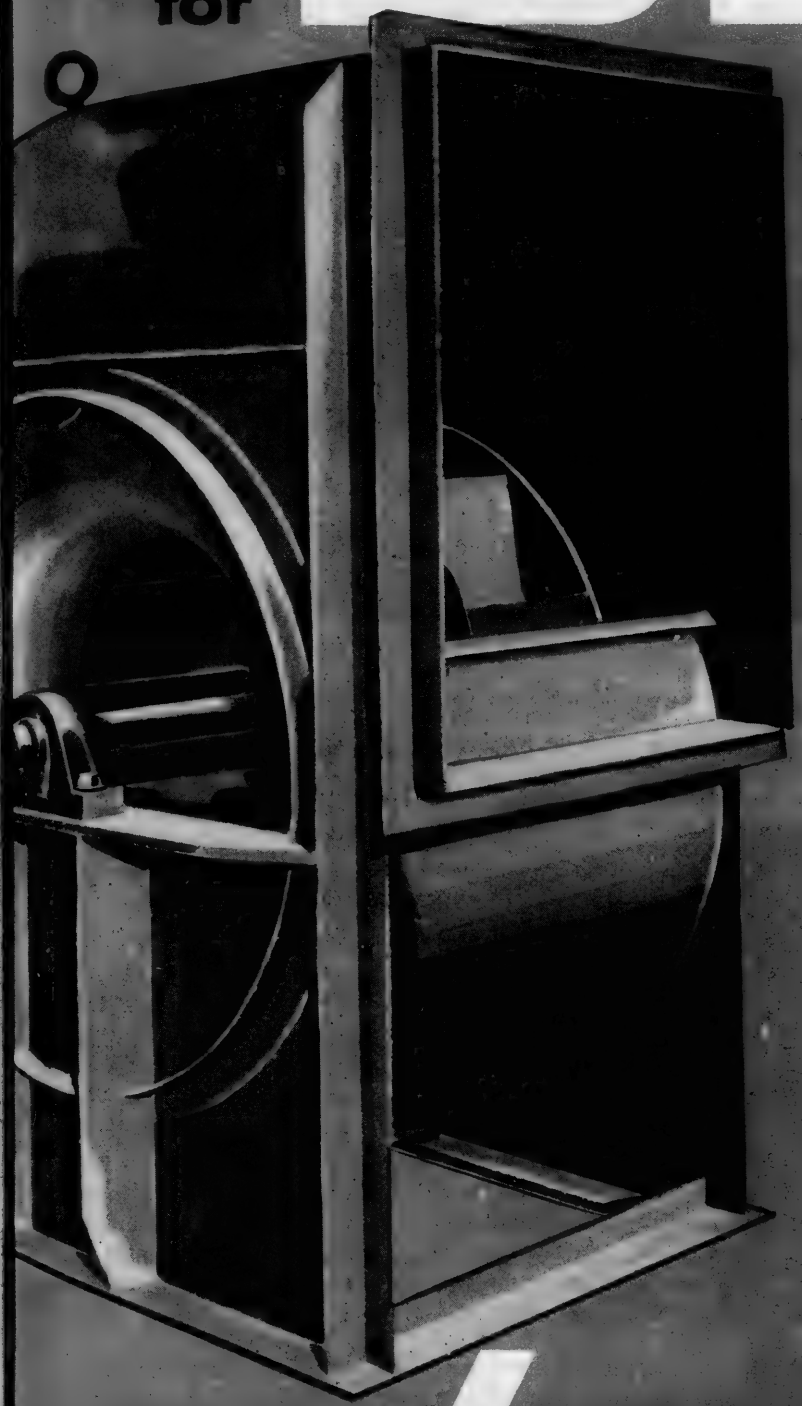
● Atomic Energy Commission Operating License No. 1 was presented by Lewis L. Strauss, chairman of A.E.C., to the Vallecitos atomic power plant near Pleasanton, Calif. Built by General Electric Company and Pacific Gas and Electric Company, installation is the first privately financed nuclear power station. Atomic action produces heat which boils water, creating steam to drive conventional turbine generators.

● The end product of a new refining process developed by Esso Research and Engineering is fluid petroleum coke, not a liquid although it flows like one. It is fine, clean, extremely hard, and clean burning, having above 90% carbon with less than ½% fly-ash. Part of a reciprocal arrangement between Delaware Power and Light Company and the new Tidewater Refinery at Delaware City, fluid coke is transported from refinery by 90 psi compressed air through three 5-inch pipelines to power plant. Boilers were designed to burn a supporting fuel since combustion of the coke is unstable due to low volatile content. Present fuel firing system consists of 88% coke, 10% gas, and 2% oil.

The BIG year for

BIG

performance



IPL

(IMPROVED POWER LIMITING)

FANS

. . . for standard duty and heavy industrial use . . .

Present day air handling problems demand BIG performance from fans. The IPL product line gives you that BIG performance because of their adaptability to an extremely wide variety of design requirements over a broad range of applications. You'll find they're extra quiet, compact, non-overloading . . . and available in all standard classes and constructions. Wheel diameters from 15 inch to 73 inch. Make the cost-saving switch now from problems to profits with IPL Fans; write today for bulletins 561 and 572.

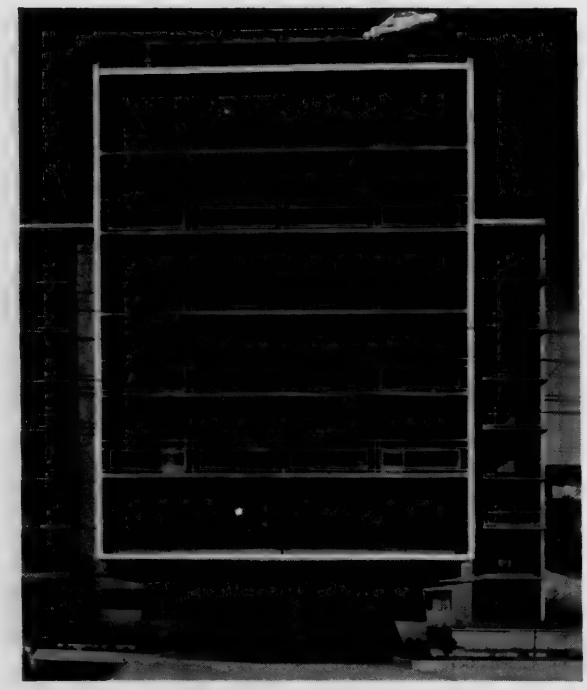
nyb

THE NEW YORK BLOWER COMPANY

Sales offices: 3147 South Shields Avenue • Chicago 16

Ford Assembly Plant, Milpitas, Calif., has Beth-Co-Weld pipe in sprinkler installation. *Sprinkler Contractor:* California Viking Sprinkler Co.

New west coast buildings *with Beth-Co-Weld steel pipe*



Skyline House, Seattle, Wash., uses Beth-Co-Weld for general-purpose piping. *Mechanical Contractor:* The Ballard Company. *Pipe Jobber:* Grinnell Company of the Pacific.

Each of these two new buildings has one thing in common—thousands of feet of Beth-Co-Weld steel pipe.

In the automobile assembly plant at Milpitas, Calif., Beth-Co-Weld is used in the sprinkler system; at Skyline House, an 85-unit luxury apartment building, Seattle, Wash., it is used as general-purpose piping.

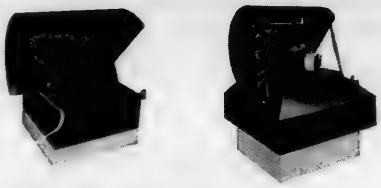
Beth-Co-Weld is ideal pipe for sprinkler installations and for general-purpose piping because it's so strong and sound. Moreover, it's economical pipe in the shop, and on the job, because it's so easy to cut, thread and weld.

Beth-Co-Weld is furnished black and galvanized, standard weight and extra-strong, in sizes from ½ in. through 4 in. It comes in 21-ft lengths, plus or minus 1 in., as well as in random and cut lengths. Be sure to specify Beth-Co-Weld on your next order for steel pipe.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

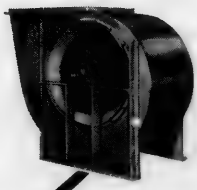
BETHLEHEM STEEL

BETHLEHEM STEEL

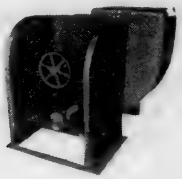


NEW ITEM

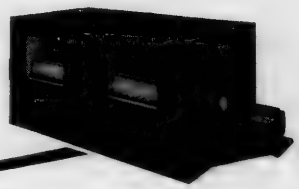
Backward curve wheel Utility Set with new outboard drive Bulletin 125 Catalog



POWER ROOF VENTILATORS, Propeller Fan Type and Power Fixed (backward curve blade) offer a wide range of sizes. Bulletin No. 119 Propeller Fan Type Bull. 124 Power Fixed Fan Type.



BLOWERS, Squirrel Cage (Forward Curve) and Power Fixed (Backward Curve) Fans available in a complete range of sizes, Single or double width. Bulletin 101 (PF) Bulletin 105 (S.C.).

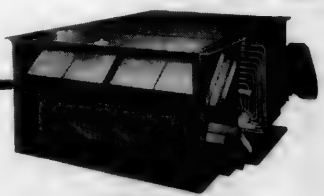


FURNACE FANS, Single, double or special width. All housing and wheel parts are die formed. Available as complete assemblies or parts only. Bulletin No. 115.

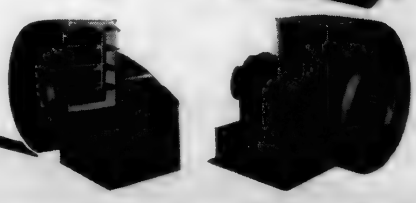
UNIT HEATERS, Blower Type floor or ceiling mounting arrangements, built in sections to facilitate efficient handling and erection. Popular sizes. Bulletin No. 112.

PROPELLER FANS, New Venturi-type Belt drive 24" to 48" wheel diameters, direct drive 12" to 30" diameters. A complete line of accessory items are available. Bulletin 117.

UNIVERSAL BLOWERS, A stock blower assembly made in single or double width, sizes 7" to 27" wheel dia. and features Universal discharge arrangement. Bulletin No. 110.



AIR CONDITIONING UNITS, Seven sizes available, ranging from 1,000 to 14,000 C.F.M. Vertical or horizontal mounting. Designed to combine cooling in summer, heating in winter. Bulletin 120.



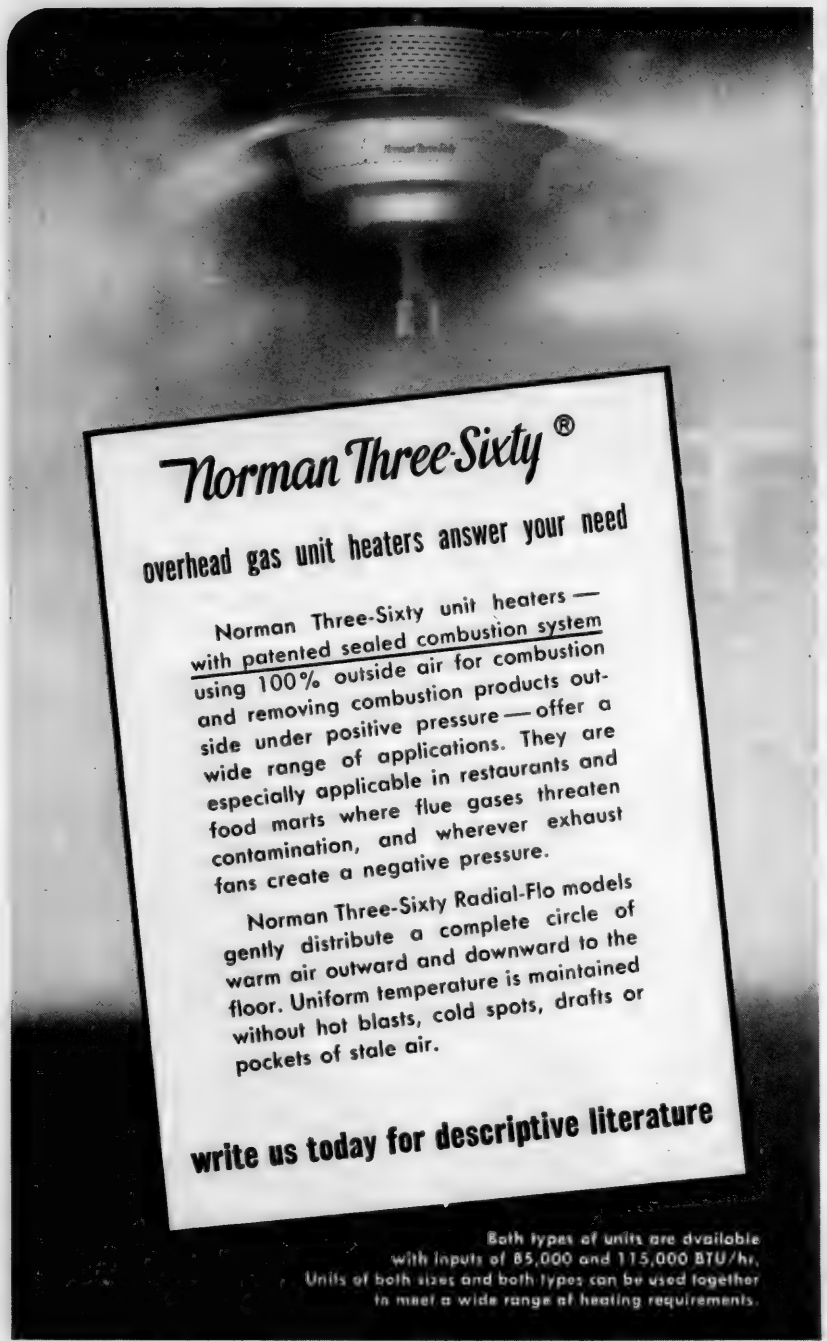
VENTILATING SETS, Utility type. Belt drive wheel diameters 7" to 30". Direct drive 6" to 13½". Both available in popular competitive sizes, self contained completely packaged units. Bulletin 109.

The BISHOP & BABCOCK Mfg. Co.

AN UMBRELLA OF COMFORT . . . OR SPOT HEATING

Norman Three-Sixty®

WITH SEALED COMBUSTION



Norman Three-Sixty®

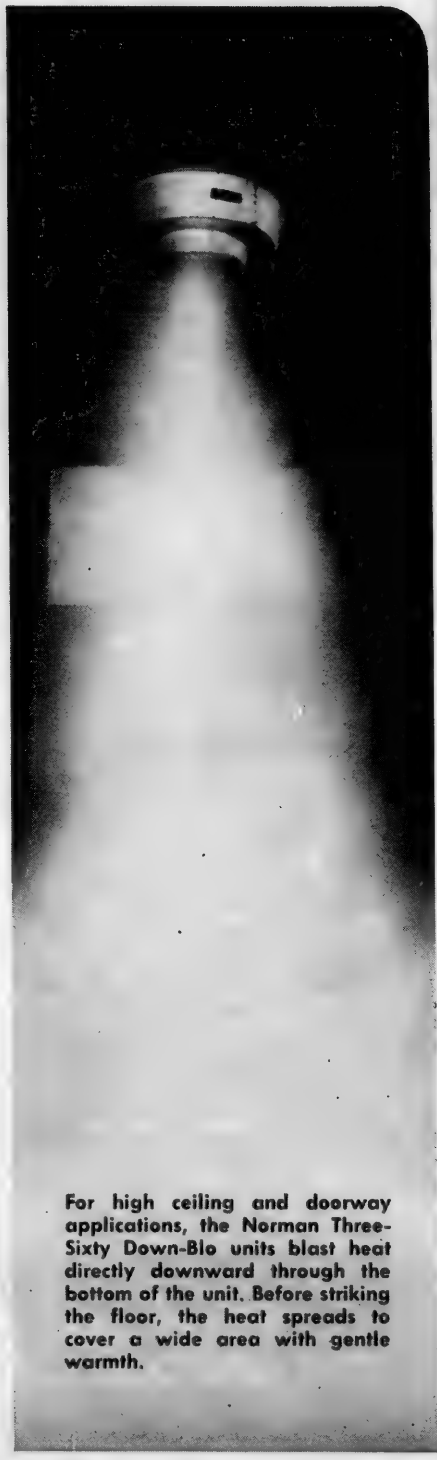
overhead gas unit heaters answer your need

Norman Three-Sixty unit heaters — with patented sealed combustion system using 100% outside air for combustion and removing combustion products outside under positive pressure — offer a wide range of applications. They are especially applicable in restaurants and food marts where flue gases threaten contamination, and wherever exhaust fans create a negative pressure.

Norman Three-Sixty Radial-Flo models gently distribute a complete circle of warm air outward and downward to the floor. Uniform temperature is maintained without hot blasts, cold spots, drafts or pockets of stale air.

write us today for descriptive literature

Both types of units are available with inputs of 85,000 and 115,000 BTU/hr. Units of both sizes and both types can be used together to meet a wide range of heating requirements.



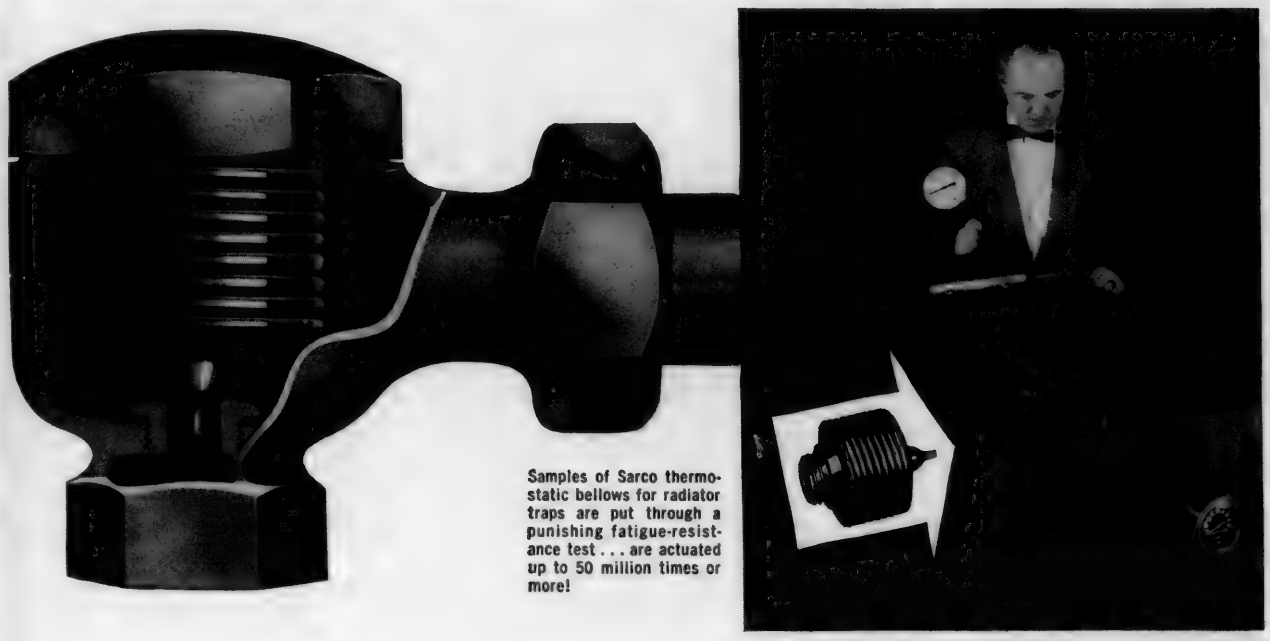
For high ceiling and doorway applications, the Norman Three-Sixty Down-Blo units blast heat directly downward through the bottom of the unit. Before striking the floor, the heat spreads to cover a wide area with gentle warmth.

Norman® products company • 1166 chesapeake ave. columbus 12, ohio

IN CANADA: A. D. PALMER & CO., Lethbridge, Alberta • Port Credit, Ontario

50,000,000 cycles can't be wrong!

How Sarco guarantees "on-the-job" performance of Thermostatic Radiator Traps



Samples of Sarco thermostatic bellows for radiator traps are put through a punishing fatigue-resistance test . . . are actuated up to 50 million times or more!

This is the most gruelling test a thermostatic radiator trap could possibly get. It's a thermostatic bellows test that goes on endlessly . . . day after day, year after year . . . in the Sarco Research Lab.

In this Sarco research and product development work, thermostatic bellows for Sarco radiator traps are expanded and contracted 50,000,000 times or more to test and study their fatigue-resistance!

Further to assure you the utmost on-the-job dependability, production samples of Sarco thermostatic bellows are tested to *10 million cycles* and more!

OTHER IMPORTANT ADVANTAGES

Extra-strong union nut and nipple — made of bar stock, not just brass castings.

Extra-rugged body — insured by *pressure* casting. Eliminates porosity. Maximum insurance against hidden defects.

Every body pressure-tested at maximum rated steam pressure.

Removable seat — for easy replacement. Seat and self-aligning valve head made of hard bronze.

ASK FOR BULLETIN 150

FOR UNDIVIDED RESPONSIBILITY on your installations, it pays to specify and order from one "Complete Line" source . . . SARCO-SARCOTHERM. Write for catalogs—to Sarco Company, Inc., 635 Madison Avenue, New York 22, N. Y.

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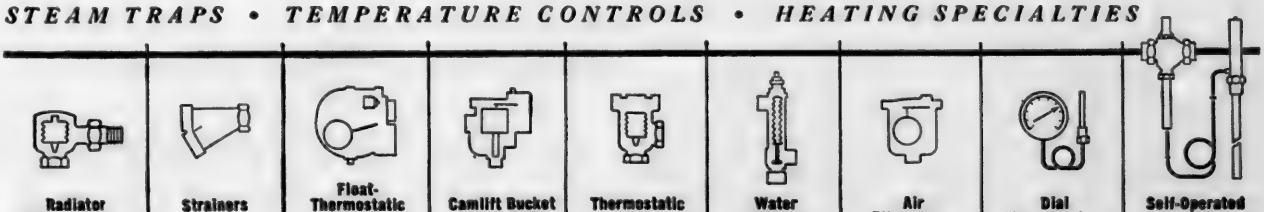
SARCO

AN AFFILIATE OF SARCOTHERM CONTROLS, INC.

Products you can rest your reputation on

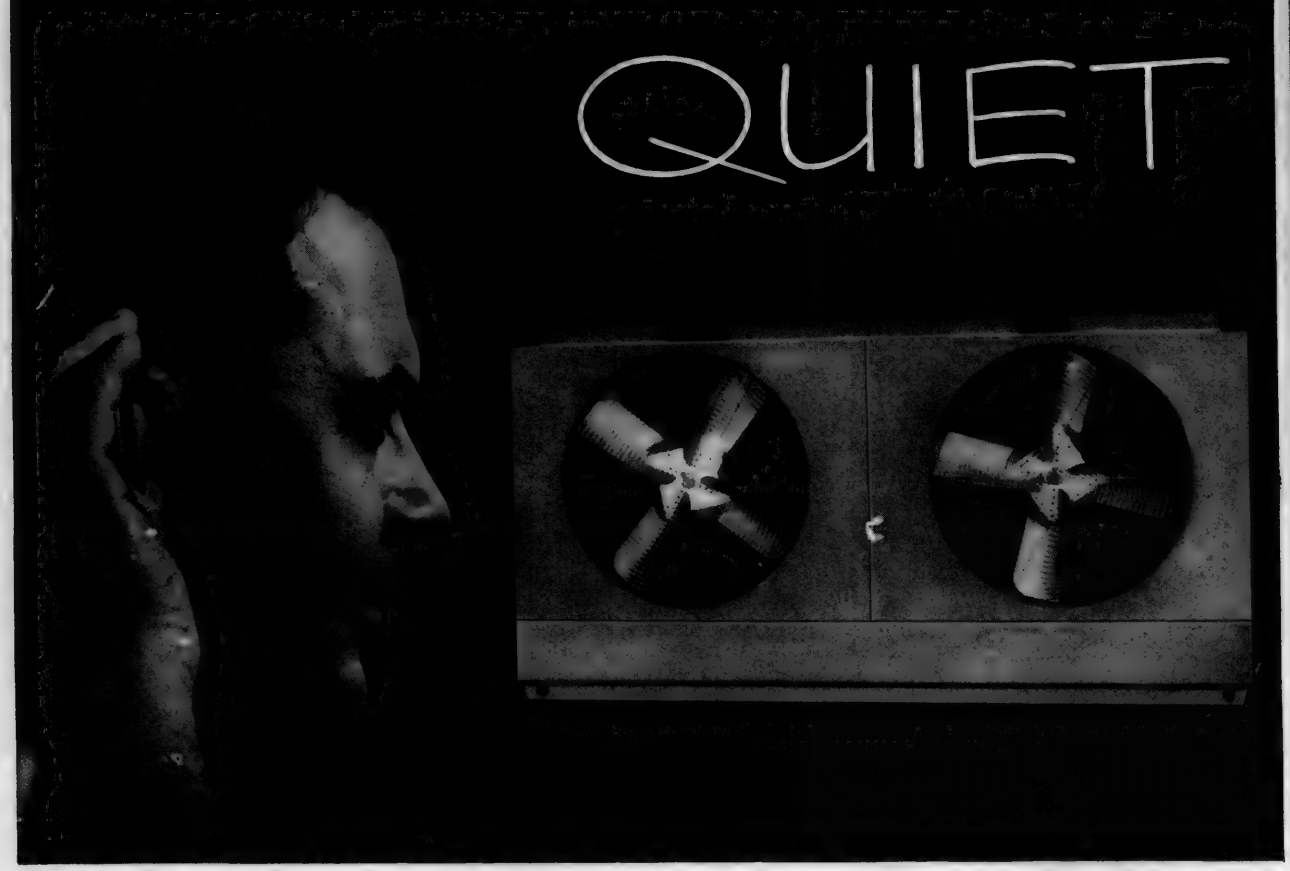
STEAM TRAPS • TEMPERATURE CONTROLS • HEATING SPECIALTIES



Radiator Valves • Traps | Strainers | Float-Thermostatic Traps | Camlift Bucket Steam Traps | Thermostatic Traps | Water Blenders | Air Eliminators | Dial Thermometers | Self-Operated Temp. Reg.

HALSTEAD & MITCHELL ENGINEERS PROVE . . .

A 100-TON COOLING TOWER CAN BE QUIET



HERE ARE TWO, NEW LARGE SIZES ADDED TO HALSTEAD & MITCHELL'S COMPETITIVELY-PRICED EC COOLING TOWER LINE

THE EC LINE. The addition of the 80- and 100-ton capacity towers extends the range of the more-value-per-dollar EC line. All 12 models, 5 to 100 tons, have outstanding features never before offered in this price group.

These include increased corrosion resistance due to rugged, 14-gage steel cabinets (12-gage sumps on the largest sizes) —weatherized by application of Vinsynite, Vinyl Zinc, and Chlorinated Rubber coatings. Exclusively, H&M offers pressure-creosoted wetted deck surfaces with the industry's only 20-Year Guarantee against rotting or damage due to fungus attack. New, sealed fan bearings are lubricated for life. Gravity-type distributing pans reduce pumping head, and cut down windage losses. Sump water levels are automatically controlled by integral float valves.

QUIET. Large diameter, four-bladed, deep pitch fans are belt-driven at low speeds by special weather and splash-proof motors. The EC-80 and EC-100 are driven at speeds of only 400 and 450 RPM. They're really quiet! Twin fans and drives power the three largest sizes, and all fans are of zinc plated, chromate dipped mild steel.

EC Series Cooling Towers are available in capacities of 5 thru 100 tons in standard, factory assembled models, or as Take-Aparts (ECK Series) for difficult-to-get-at installations. Residential, direct-drive ECD Series, with all the custom features and also competitively priced, come in capacities of 2 thru 7½ tons. Call your nearest Halstead & Mitchell wholesaler for delivery and prices or write: *Halstead & Mitchell, Bessemer Building, Pittsburgh 22, Pa.*

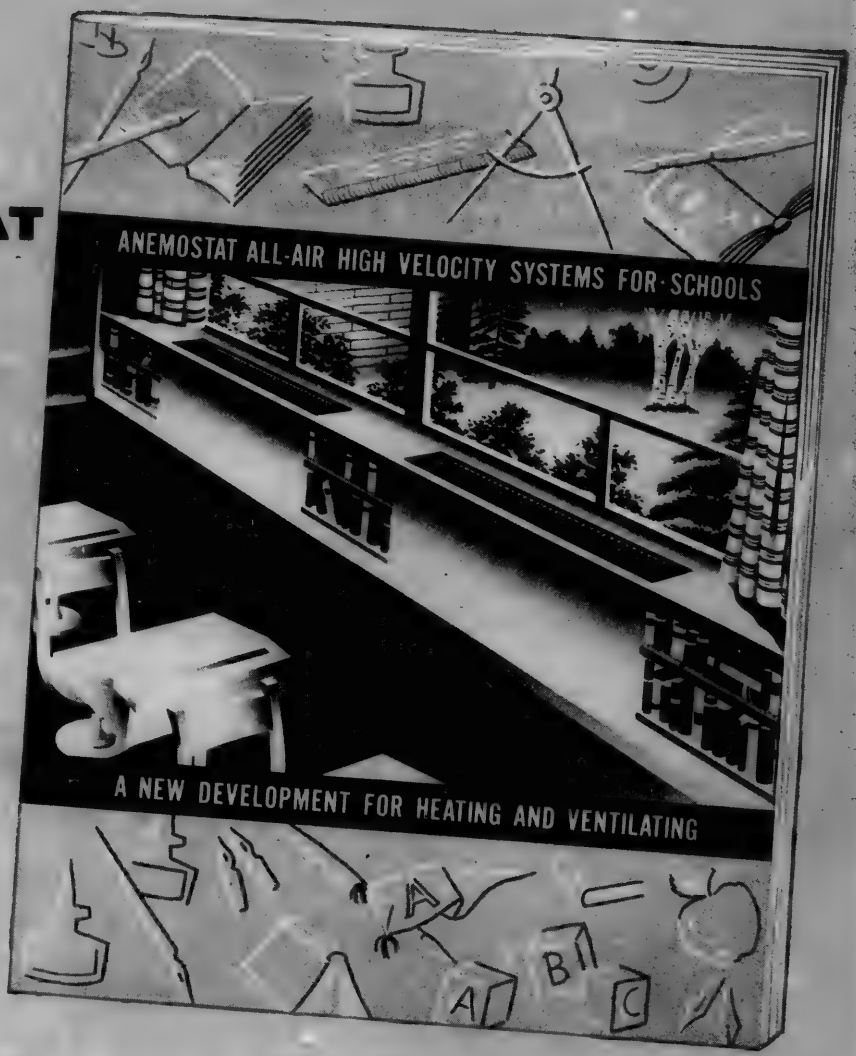
WRITE FOR COMPLETE DETAILS

HM Halstead & Mitchell

Are you building a new school or renovating an old one?

New ANEMOSTAT SCHOOL CATALOG

contains *necessary* application and selection data



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Gentlemen:

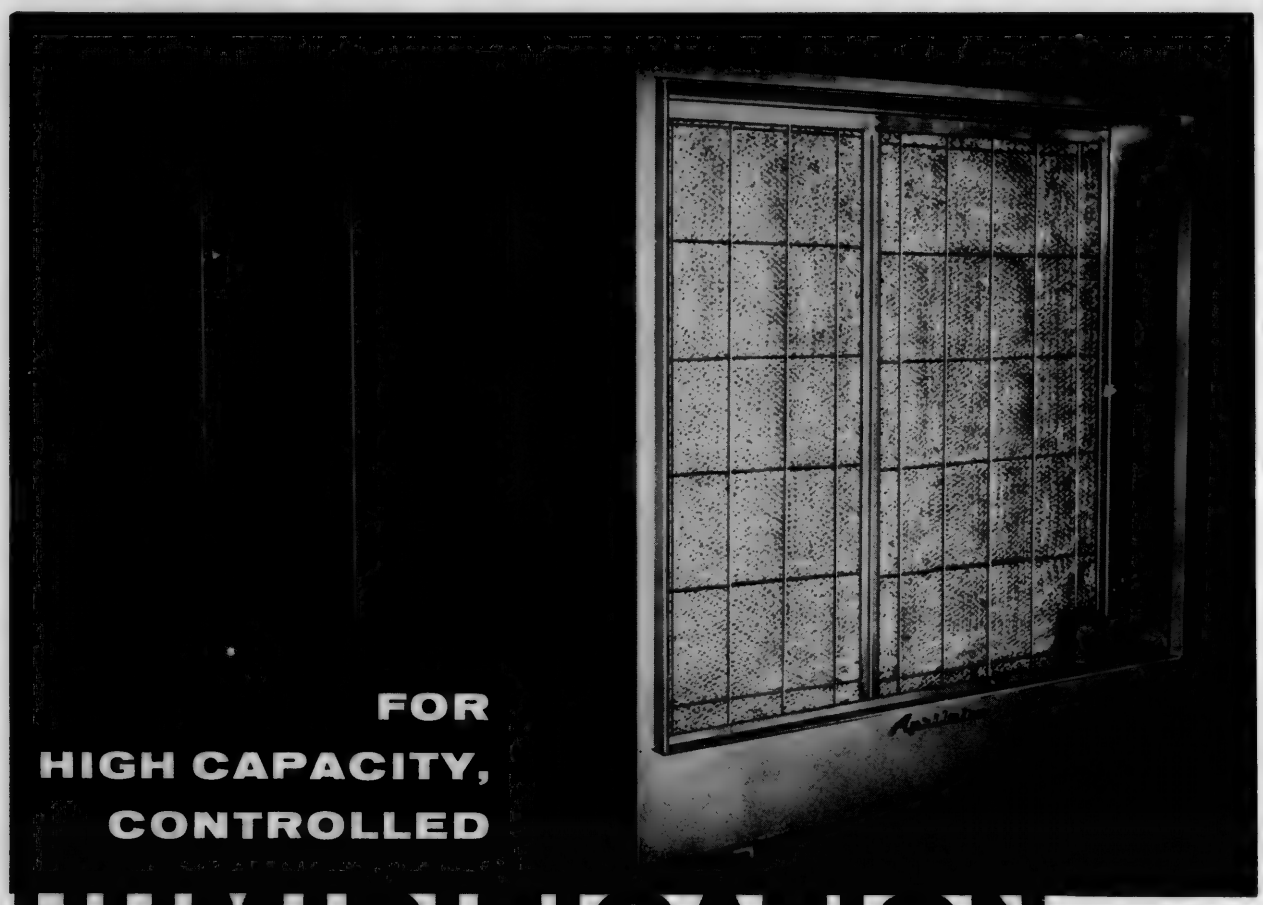
Please send me, without obligation, a copy of your new School Catalog.

Name..... *Position*.....

Company .....

Address.....

City..... *Zone*..... *State*....



FOR
HIGH CAPACITY,
CONTROLLED

HUMIDIFICATION

RP **Aprilaire**

AUTOMATIC-ELECTRIC HUMIDIFIERS

HIGH CAPACITY
Aprilaire Industrial Humidifiers (illustrated) are designed to provide capacity for practically any size requirements. Unit sizes up to 10 G.P.H.—can be installed singly or in a series of any number of units.

POSITIVE CONTROL
The Aprilaire introduces relative humidity as needed . . . and only when needed. Automatic control eliminates possibility of lag or over-run.

FLEXIBILITY
Aprilaire industrial models are easily installed packaged units. Available for gas, steam or hot water source, every model can be pedestal-mounted or suspended—according to individual requirements.

BACTERIA REMOVAL
Super-clean air, carrying moisture in vapor form only, is delivered by the Aprilaire's unique principle, incorporating the use of air filters and mineral coated evaporating elements. This exclusive humidification method removes up to 70% of the bacteria in the air stream circulating through the unit.

ISOTHERMAL OPERATION
The Industrial Aprilaire has no temperature effect on the humidified air. Exhausted, humidified air is discharged at the same temperature it enters the unit.

MINIMUM MAINTENANCE
Because the only liming or water solids deposits occur on the inexpensive, replaceable evaporating elements . . . mechanical difficulties from these usually troublesome deposits are eliminated.

INDUSTRIAL AND RESIDENTIAL MODELS AVAILABLE—WRITE FOR COMPLETE INFORMATION

see our catalog in S PLANT ENGINEERING FILE or write for copy

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RESEARCH PRODUCTS Corporation

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JENKINS

O.S.&Y. U-BOLT GATE

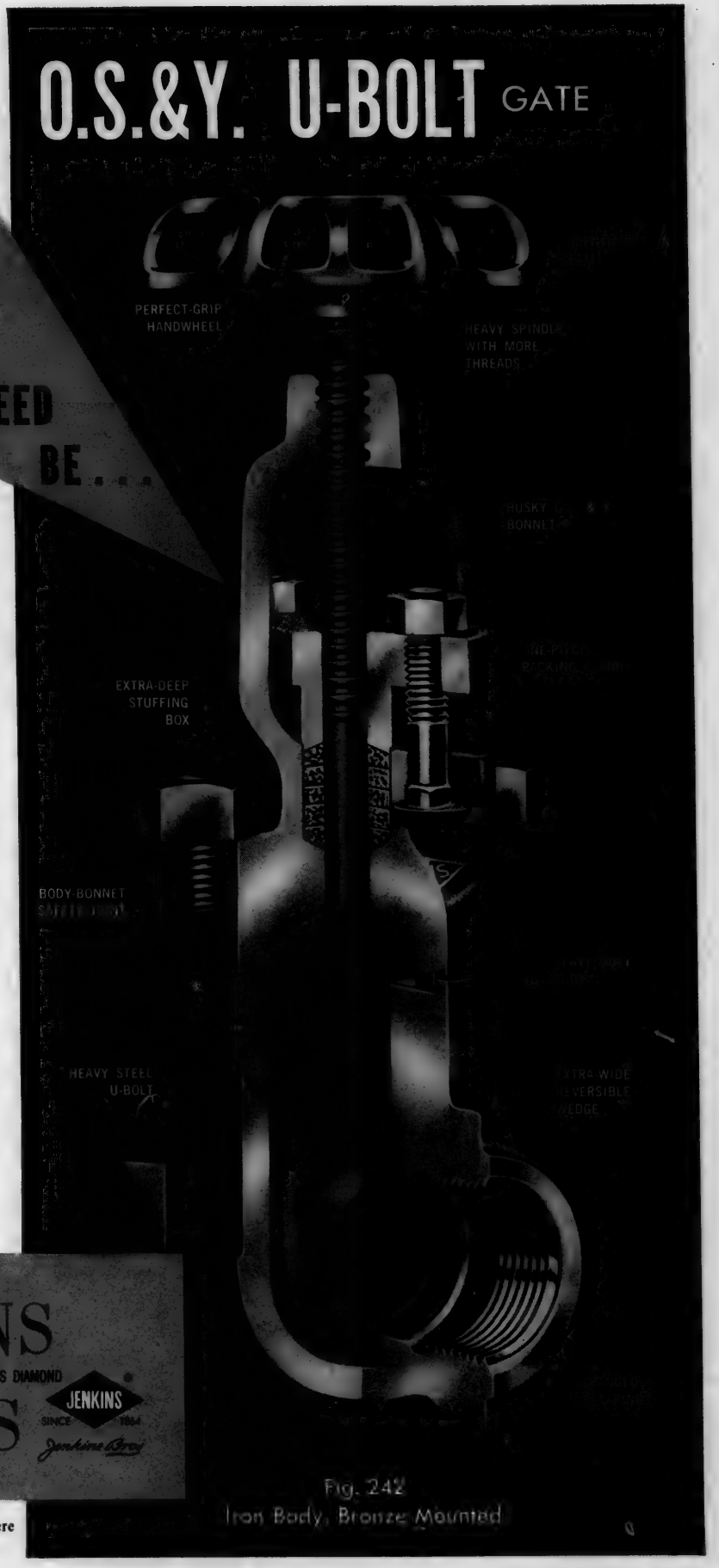


Fig. 242
Iron Body, Bronze Mounted

MADE BETTER THAN NEED BE....

Costs Less to Use

YOU PAY NO MORE for the extra quality you see in every part of a Jenkins Outside Screw & Yoke U-Bolt Gate valve. Yet longer life and reduced maintenance is bound to result from the extra ruggedness, the precision manufacture and unique design features which Jenkins puts into these popular, general utility valves.

Choose the Outside Screw & Yoke pattern for services where spindle threads must be kept out of the destructive effects of fluids in the line; where spindle threads must be cleaned and lubricated regularly or where a rising spindle is needed to indicate wedge position.

Choose JENKINS, whether O.S. & Y. or Inside Screw pattern, for valves built to save maintenance dollars.

WIDE RANGE OF JENKINS U-BOLT GATES

GET FOLDER NO. 207 which describes Inside Screw and O.S. & Y. patterns . . . Iron Body with Bronze or Stainless Steel Mounting . . . All-Iron and Ni-Resist with type 316 Stainless Steel trim. Ask your local Jenkins Distributor or write Jenkins Bros., 100 Park Avenue, New York 17.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864
Jenkins Bros.

Sold Through Leading Distributors Everywhere

R. H. Macy & Co., Roosevelt Field, L.I., N.Y. Architects: Skidmore, Owings, and Merrill; Consulting Engineers: Syska and Hennessy, Inc.; General Contractor: Turner Construction Co.; Mechanical Contractor: J. E. Schecter Corp.

Comfort-conditioned shopping insures profitable customer and employee relations, effective store merchandising. American Blower fans and air-conditioning units help make this possible at Macy's.

C. V. Scott, of American Blower; A. L. Windman, of Syska and Hennessy, Inc.; and J. E. Schecter, of J. E. Schecter Corp., review blueprints used in installing Macy's air-conditioning system.

Macy's newest serves one million thrifty shoppers in air-conditioned comfort

A PROBLEM: How do you air-condition a three-level, 144-department store and maintain every inch of sales space — especially when you want to keep the roof clear for future expansion?

THE SOLUTION: Designers for Macy's new Roosevelt Field, L.I., suburban store found the answer by locating the equipment in a plenum area between roof and ceiling. Space was at a premium. Equipment had to fit within very close tolerances.

RESULT: American Blower's experience and engineering know-how enabled them to meet the challenge of this unusual installation. Air-conditioning and air-handling units were selected to give the required capacity within the size and space limitations.

Are you planning to air-condition? If so, call your nearest American Blower branch office. You'll get dependable, quality products — helpful service all the way! American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

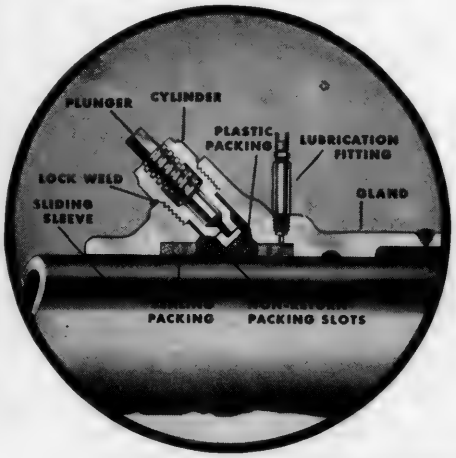
AMERICAN BLOWER

Division of AMERICAN-Standard

QUALITY PROTECTS YOUR INVESTMENT . . . AMERICAN-Standard QUALITY IS AVAILABLE AT NO EXTRA COST

new savings
for expansion joint users

Cross-section of Gun-Pakt feature. To add packing, just add a plug and turn the plunger. Note non-return packing slots at bottom of cylinder.



The Yarway Type W Gun-Pakt Expansion Joint has an improved one-piece design of body and gland and improved method of packing that provide new maintenance economies and greater operating efficiency.

Bolted joint between body and gland is eliminated; the steel body includes gland and guide. Shorter face-to-face dimensions are possible. Improved angle of packing guns makes them more accessible and *permits injection of the special plastic packing directly into packing space.*

The famous Yarway *Gun-Pakt* feature permits *addition of packing under full steam pressure. No need for costly shutdowns to repack.*

Sizes 1½" to 30", pressures 150, 300, 400 psi. Single or double types, flanged or welding ends.

For full description, write for new Yarway Bulletin EJ-1916.

20" Yarway Type W Gun-Pakt Joint with base, single type, welding ends, 8 guns.

YARNALL-WARING COMPANY
104 Mermaid Avenue
Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

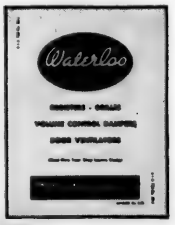
YARWAY

...a good way to specify expansion joints

Perfect Air Diffusion in the Truman Library with ANEMOSTAT AIR DIFFUSERS *and* WATERLOO GRILLES

Here is a combination—Anemostat Air Diffusers and Waterloo Return Air Grilles—which insures perfect air diffusion in the new Harry S. Truman Library in Independence, Missouri. • Anemostat Type E-1 *Aspirating* Air Diffusers provide true draftless comfort and uniform air distribution in each room of this modern building. Quality-designed Waterloo Grilles act as efficient returns in this system. • Put this performance-proved "team" of Anemostat Air Diffusers and Waterloo Grilles to work in your next heating, ventilating or air conditioning application. They are your assurance of top air diffusion performance.

For complete data on Anemostat Air Diffusers, write for Anemostat Selection Manual No. 60.



For helpful information on Waterloo Registers and Grilles, write for Catalog showing Waterloo's wide range line.

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DRAFTLESS *Aspirating* AIR DIFFUSERS
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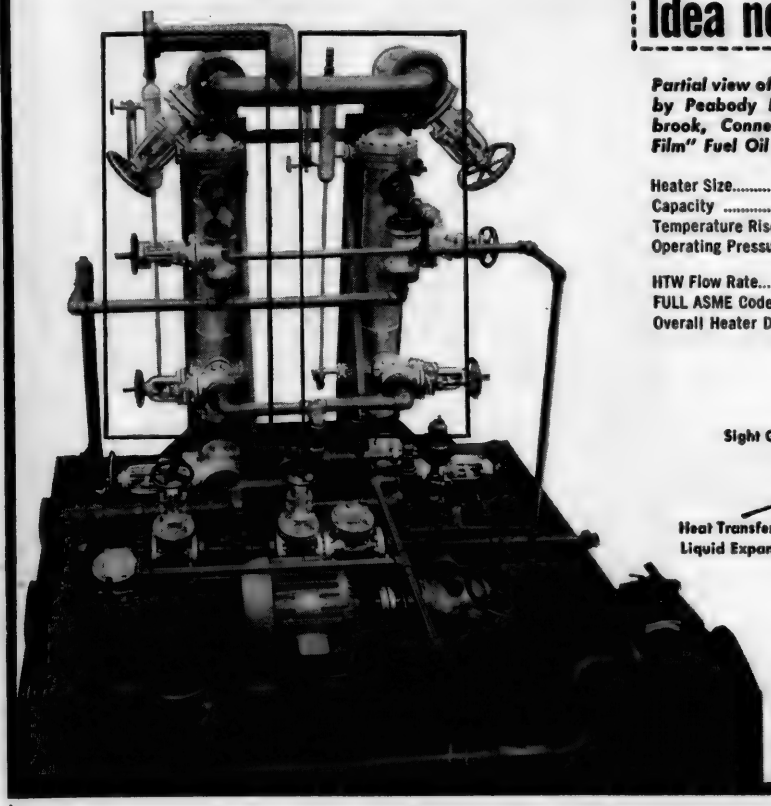
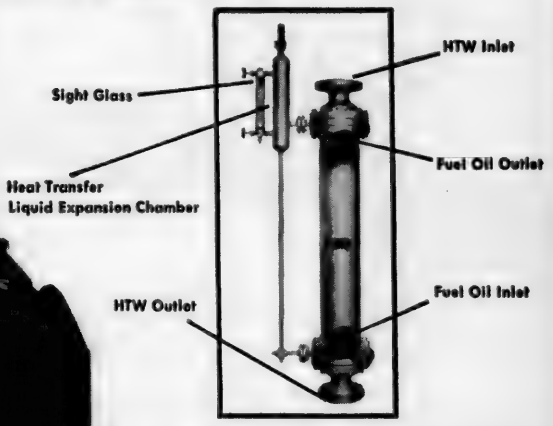
REGISTERS • GRILLES • VOLUME
CONTROL DAMPERS • DOOR VENTILATORS



Idea no. 2 from Paracoil

Partial view of pump and heater set fabricated by Peabody Engineering Corporation, Glenbrook, Connecticut, utilizing two "Thermo-Film" Fuel Oil Heaters of these specifications:

Heater Size	FF-48 HTW "Thermo-Film"
Capacity	7500 lbs. No. 6 oil per hour
Temperature Rise	80°F to 210°F
Operating Pressures	300 psi, water side 315 psi, oil side
HTW Flow Rate	100 GPM at 370°F
FULL ASME Code Construction	
Overall Heater Dimensions	15" x 6'-6"



How to use High Temperature Water directly in a #6 oil heater...without danger of system contamination!

The Problem

The pre-heating of #6 fuel oil with High Temperature Water to provide adequate oil temperature and eliminate possibility of leakage of fuel oil into the HTW stream.

Leakage of fuel oil into the HTW stream would result in contamination of the system and could cause serious and costly damage to the boiler and the entire system.

The isolation of the fuel oil heaters can be accomplished by several methods. For example, the HTW stream may be passed through an evaporator to supply steam for use in a steam-type fuel oil heater. Or, the HTW stream may be passed through an intermediate water-to-water exchanger to heat a secondary water stream circulated through a water-type fuel oil heater.

In both of these systems, the HTW stream is safely isolated from the fuel oil heater by an intermediate secondary circuit. But effective as these methods are, they both require a minimum of two heat exchangers, additional space and additional connecting piping, regulators, level controls, etc.

A New Solution

Now for the first time the Paracoil "Thermo-Film" Fuel Oil Heater furnishes the optimum solution to the problem. **In a single exchanger** the "Thermo-Film" Heater provides adequate oil temperature, isolation of the HTW circuit from the oil circuit, a reduction in space requirements, simplicity of operation and substantially lower initial installation cost. A number of double tube elements are enclosed within the heater shell providing three circuits: the primary HTW circuit, an intermediate heat transfer fluid circuit, and the oil circuit.

The heat flow path is from the HTW to the heat transfer fluid to the fuel oil. In the rare event of an oil tube failure, the free oil cannot contaminate the HTW stream as it becomes trapped in the intermediate space containing the heat transfer liquid, and gives warning to the operating personnel by rising in the indicating gauge glass at the expansion chamber.

Your inquiries for Paracoil "Thermo-Film" applications to HTW systems are invited.

CUT ALONG DOTTED LINE AND SAVE

DAVIS ENGINEERING CORPORATION

30 Rockefeller Plaza, New York 20, New York • Circle 6-5650

Air Conditioned Throughout with

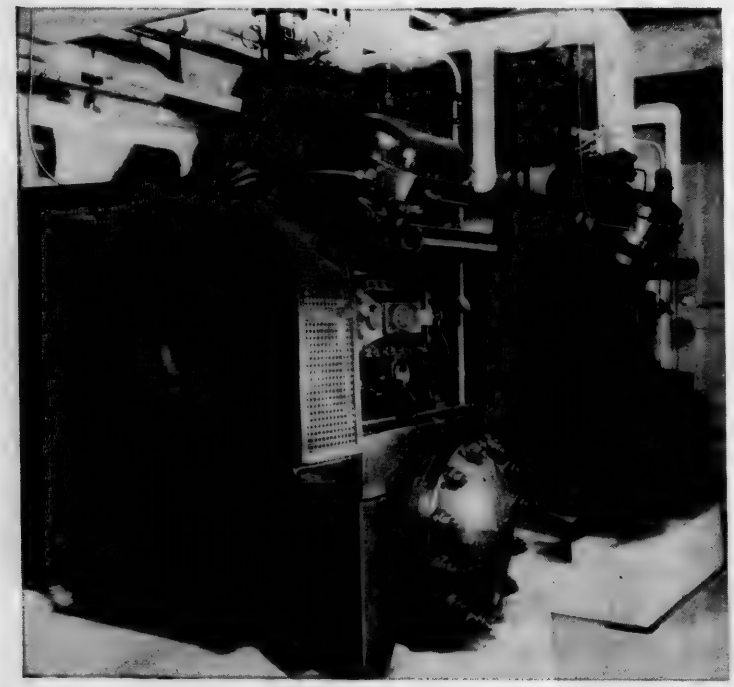
TRADE FRICK MARK

Refrigeration

4200 Marine Drive Apartments, Chicago, Ill. Architect: Lewis Simon. Mech. Eng.: Arthur Wallace. Installing Contractors: Midwest Eng. & Equipment Co., Economy Plumbing & Heating Co.

These sixty-four new apartments at 4200 Marine Drive, in Chicago, enjoy complete air conditioning, among other advantages.

Two "ECLIPSE" refrigerating units, installed by Midwest Engineering and Equipment Co., Frick Sales-Representatives in Chicago, carry the cooling load with economy and dependability.



What are YOUR cooling needs? If you want cool air, cold drinking water, ice, freezer temperatures, or refrigeration for processing—in any commercial or industrial size—let us quote now on your requirements. Branches and Distributors in principal cities, the world over.

Frick "ECLIPSE" refrigerating units at 4200 Marine Drive Apartments, Chicago

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA., U. S. A.

*Why 18 miles of SNAP*ON was used in huge Conrad Hilton air conditioning installation...*

More than 18 miles of Snap*On glass fiber pipe insulation was installed in the new air conditioning system of the Conrad Hilton Hotel in Chicago, the world's largest hotel. Snap*On, in one-piece sections, with vapor barrier jackets adhered was selected because it is the fastest and most economical way to insulate piping, particularly large pipes like the Conrad Hilton's dual-temperature water lines . . . and because—

- **Snap*On is fire resistant.**
- **Snap*On has the highest thermal efficiency of any pipe insulation in its temperature range.**
- **Snap*On is uniform in wall thickness.**
- **Snap*On has fewer joints that can lead to heat loss, heat gain, or vapor condensation.**

Available in a wide range of lengths, wall thicknesses, and jackets, there is a Snap*On pipe insulation for your next job.

WRITE TODAY FOR COMPLETE INFORMATION ON ONE-PIECE SNAP*ON GLASS FIBER INSULATION FOR HIGH VELOCITY DUCTS AND HOT AND COLD PIPING

GUSTIN-BACON *Manufacturing Company*

GUSTIN gb BACON

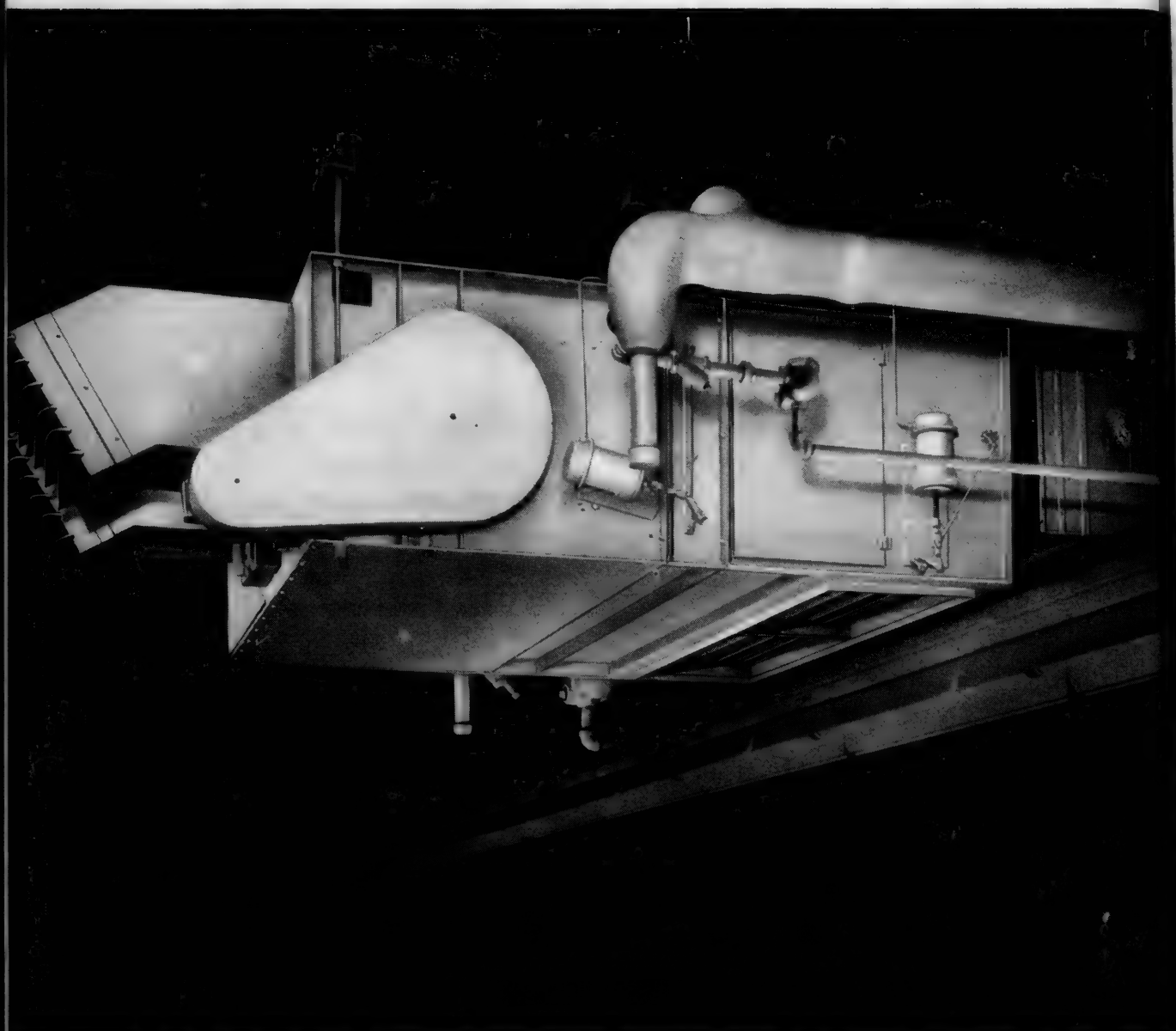
Thermal and acoustical glass fiber insulations • Pipe couplings and fittings • Molded glass fiber pipe insulation

222 W. 10 ST., KANSAS CITY, MO.

Snap*On—Trademark Reg.

Insulation Contractor:
Culberg Asbestos & Cork Co.

Wherever there's air t
there's Trane equipment t



For high-pressure air conditioning systems . . . industrial processing and drying . . . TRANE Class III Fans save space, cut power costs. Complete range of 15 standard sizes from 18 to 73 inches, for static pressures up to 11½ inches. Capacities to 310,000 cfm. TRANE Fans are tested and rated under the NAFM code.

For ventilation . . . the new TRANE Centrifugal Roof Ventilator comes in 16 sizes, all with certified power ratings. All-new design with scientifically contoured inlet cone gives greater efficiency, more cfm with less power. Fan sizes from 7′ to 40′ wheel; streamlined, compact; shipped fully assembled, ready to install.

For built-up systems . . . TRANE Coils have exclusive Delta Flo Fin (inset) that eliminates stagnant air next to fin surface, increases heat transfer capacity. More efficient fins permit wider spacing for easier cleaning, reduced maintenance. Mechanical fin-to-tube bond is as strong as the metal itself!

r to heat or move, t to do the job

One source, one responsibility for every factory heating, ventilating need!

Now you can pinpoint responsibility for all your factory heating, ventilating needs with the complete TRANE line of *matched* equipment! That means you order from one reliable source . . . simplify purchasing, operation and maintenance.

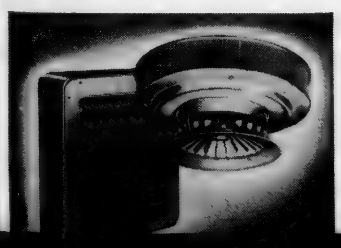
And now, the TRANE lines are more versatile, more complete than ever before! New Centrifugal Roof Ventilators . . . new Cabinet Fans . . . new Torrivent . . . new Steam Specialties . . . a wider range of sizes and models give you everything you need to handle *any* factory ventilating or heating job.

So when you plan, remember that TRANE equipment is *matched* equipment: designed and built together to work together! Whether it's a unit heater for a doorway or equipment for a complete heating-ventilating system, TRANE product lines are complete in every respect.

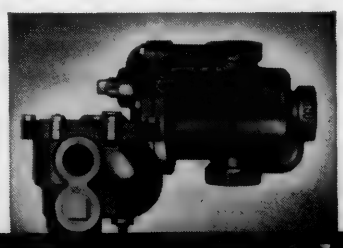
WANT MORE FACTS? Ask your nearby TRANE Sales Office or write TRANE, La Crosse, Wisconsin.

Heat and ventilate large areas with the modern TRANE Torrivent. Unit shown is installed in a garage, where it supplies fresh air and heat. Rugged and dependable, the Torrivent is installed with a fresh air intake duct, combination filter and mixing box so that it can supply any desired mixture of fresh and recirculated air—or recirculated air only, as needed. Note the pneumatically controlled face and by-pass dampers for tempering air . . . vibration isolators . . . standard 30° discharge nozzle with directional louvers. Unit shown is installed with TRANE Steam Specialties. Torrivents available in 9 sizes, capacities from 1,250 to 33,000 cfm.

For spot heating . . . TRANE Unit Heaters steer heat in any direction, any proportions, even *different* directions, proportions at the same time! Projection Unit (right) has Louver Cone Diffuser that gives up to 60% more throw. Horizontal Unit (left) has Louver Fin Diffuser for blanketing or spot throw.



To save fuel, stop waste, protect equipment . . . the complete line of TRANE Steam Specialties includes bucket traps, strainers, F and T Traps—plus vents and valves for all kinds of heating or process applications. TRANE equipment is *matched* equipment—designed and built together, to work together!



For <u>any</u> air condition, turn to

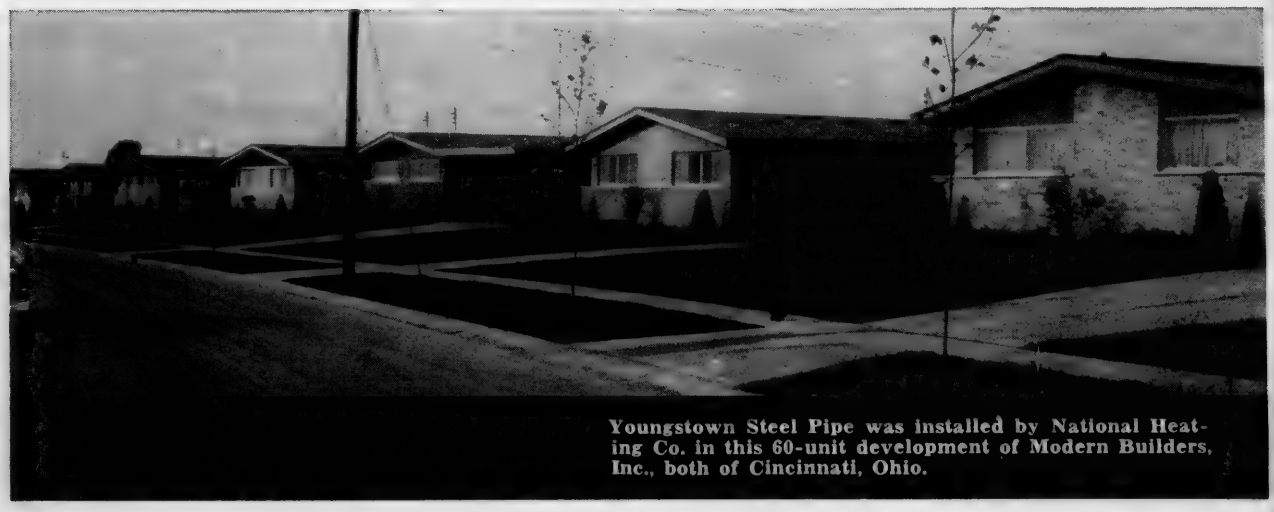
TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS. • SCRANTON MFG. DIV., SCRANTON, PA.
TRANE COMPANY OF CANADA, LTD., TORONTO • 96 U.S. AND 19 CANADIAN OFFICES

Youngstown steel pipe

. . . Gives Long, Maintenance-Free Life to Radiant Heating Installations



Youngstown Steel Pipe was installed by National Heating Co. in this 60-unit development of Modern Builders, Inc., both of Cincinnati, Ohio.

Specify Youngstown and secure these 7 Points of uniform goodness

uniform ductility
uniform lengths
uniform threading
uniform weldability
uniform wall thickness and size
uniform strength and toughness
uniform roundness and straightness

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities

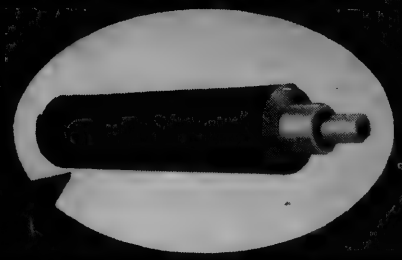
Modern residential developments—like this 60-unit project off Cincinnati's Winton Road—demand only the most modern heating facilities. So, to afford these new homeowners warm, draft-free rooms of equalized temperatures, invisible radiant heating systems utilizing Youngstown Steel Pipe were installed.

For years Youngstown Steel Pipe has been specified by leading architects as well as progressive plumbing and heating contractors for its dependability and long life. That's because it's made of only the finest steel by steelmen with over half-a-century of steelmaking knowhow. All Youngstown operations from ore mining to finish threading are closely quality-controlled to give you the best piece of pipe obtainable anywhere. Why not make Youngstown your specification for long, trouble-free installations?

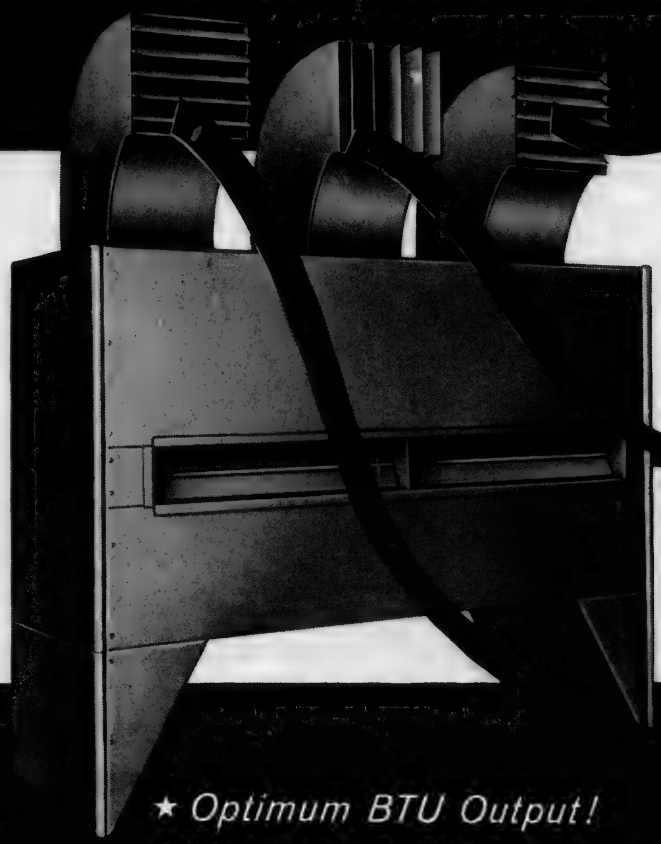
For additional information or service, contact your local Youngstown distributor—or phone our nearest District Sales Office, today.

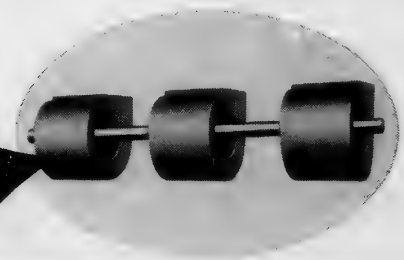
An Exclusive Design for Industrial Applications...

WESTINGHOUSE INDUSTRIAL UNIT HEATERS



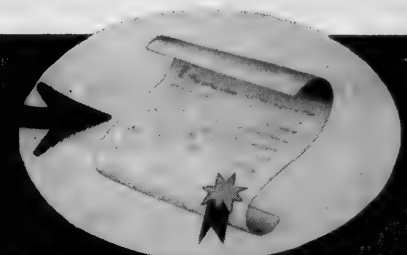
HEATING COILS — Two types: Heavy Duty (shown above) with extra heavy wrought iron finned pipe for high pressure systems or process work. General Purpose, with non-freeze, non-ferrous heating coils.





FAN ASSEMBLY—Centrifugal pressure multi-blade, die-formed type. Self-aligning, grease-lubricated ball bearings are mounted outside the casing for easy maintenance.

★ *Optimum BTU Output!*
★ *Optimum Air Capacity!*
★ *Optimum Versatility!*



ONE WARRANTY — Westinghouse makes every component — COILS, FANS, MOTORS. One supplier responsibility for quick service.

Fourteen basic coil sizes are available to give you optimum (most favorable selection) for either steam or hot water; up to 200 PSIG from 100,000 to 4,000,000 BTU/hr; air capacity for effective circulation, 2,000 to 34,000 CFM.

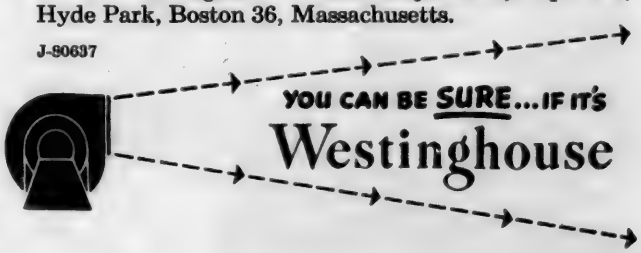
Sturdy casings, heavy-duty bearings and Westinghouse proven-plate fin-coil construction and performance give you a product to meet your most exacting application requirements.

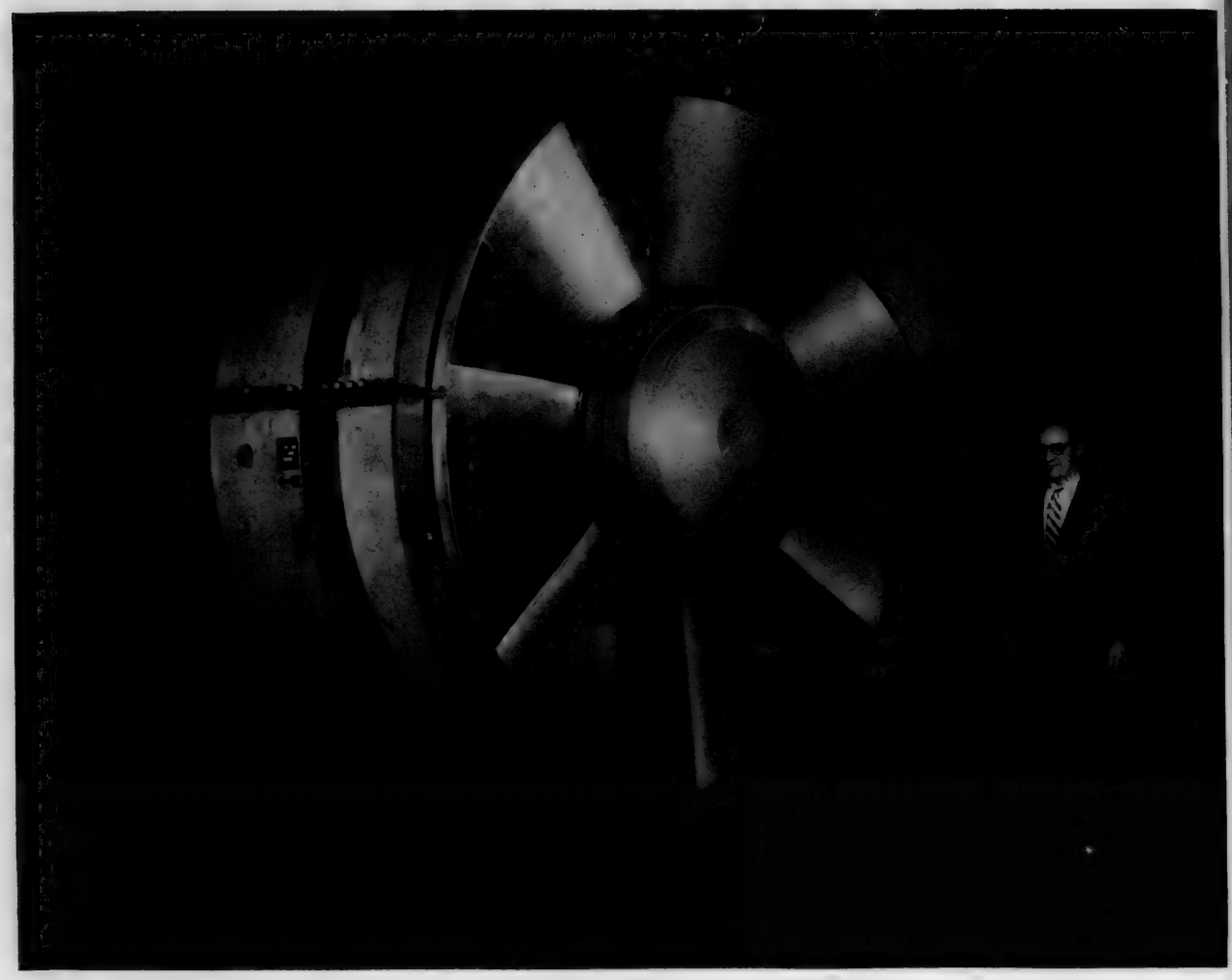
You can't buy more rugged *quality* and *versatility* than is built into the Westinghouse line of unit heaters, designed *exclusively* for industrial applications.

Further, compact Westinghouse units can be mounted on the floor, wall or ceiling, can be relocated to accommodate changes in plant layout. And every unit is backed by a Westinghouse exclusive—*one warranty*—for engineering assistance and single equipment responsibility.

Next time you buy or specify Industrial Unit Heaters, call your Sturtevant Division Sales Engineer. For your copy of Industrial Heater Catalog 1510-2, call him now or write Westinghouse Electric Corporation, Dept. A-5, Hyde Park, Boston 36, Massachusetts.

J-80637





WHERE AIR MOVING REQUIRES AXIAL FLOW FANS, "BUFFALO" AXIALS HAVE MOST TO OFFER

Big jobs, like the one shown above . . . or smaller jobs, like the hood exhaust at lower left . . . "Buffalo" Axial Flow Fans take them all in stride.

The demand for "Buffalo" Axials is steadily increasing, because they offer so many superior advantages. Among these are extremely high efficiencies, quiet operation, built-in rigidity of construction and compact size. Ideal for straight-line duct connections, "Buffalo" Vaneaxial Fans eliminate the swirling motion of air by means of scientifically-engineered guide vanes. This energy is thus converted into useful forward thrust.

"Buffalo" Axial Flow Fans are the perfect solution to many space problems. Duct-size, they hug walls and ceilings, conserve productive space. They are doing an outstanding job in space-saving applications ranging from exhaust and ventilation to air conditioning.

If your specifications call for axial flow fans, be sure they're "Buffalo" Axials. Contact your nearest "Buffalo" Engineering Representative, or write us today for Bulletin 3533-EF.

HOOD EXHAUST — Right in the Stack. Duct-size "Buffalo" Axial Flow Fans are economical to install — singly or in multiple — for in-stack exhaust applications utilizing a weather-protective hood. Installations such as this are popular in plants . . . wherever space is at a premium.

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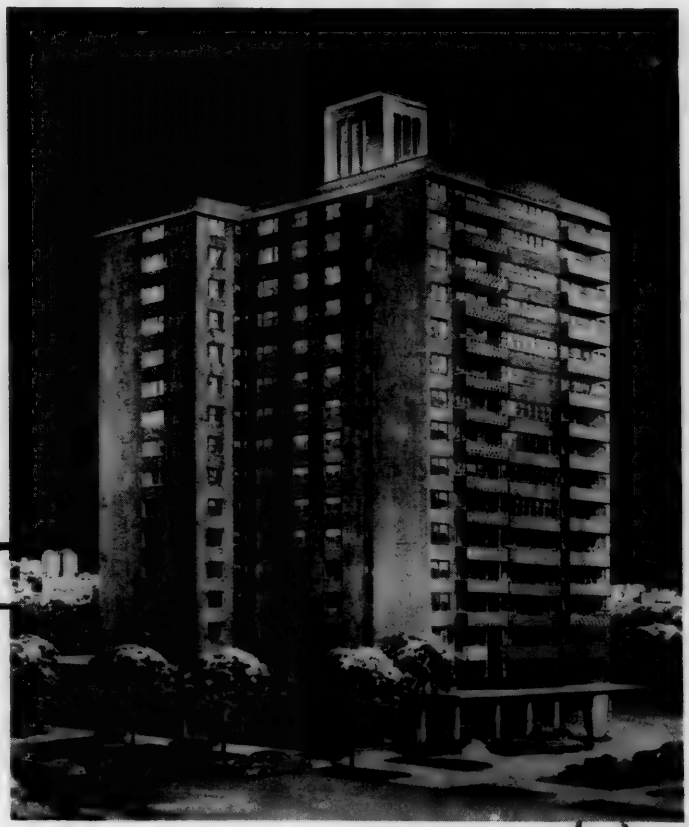

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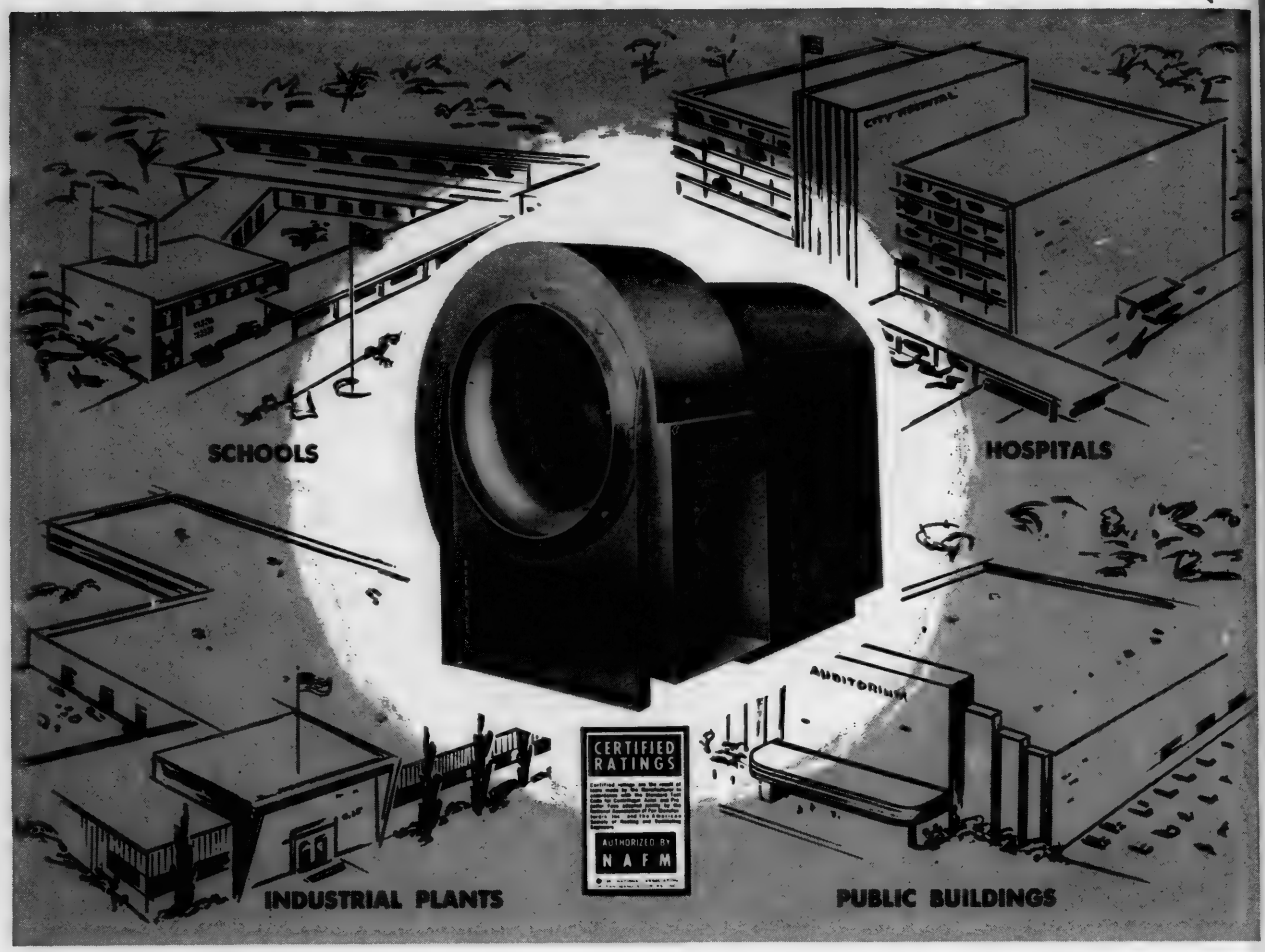

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Heat saved when rooms are unoccupied. Temperatures can be lowered in unoccupied rooms, which can be quickly reheated when needed. Motel and hotel owners, for example, say Iron Fireman heating the finest ever devised. It cuts fuel costs and pleases guests.

A thermostat in every room. Every type of building or home can now have individual room temperature control, at a cost comparable to that of many steam or hot water systems which do not make each room a separate heating zone.

Architects and heating engineers readily recognize that Selectemp heating solves many stubborn heating problems. Now you can actually heat a building to please everyone. Room occupants enjoy a new standard of comfort, regardless of the building's exposure to cold winds, heat from the sun—or the number of people in the room.

A heating engineer (who expressed skepticism at first), wrote as follows, after a winter's experience with SelecTemp in his own office:

"We have experienced sub-zero temperature with high winds. Our office has been held at an ideal temperature, with almost no variation up or down. We now consider this SelecTemp system the most marvelous and satisfactory heating installation we have ever seen, and expect to specify it in many of our own jobs."

Continuous, *modulated* heat. Air circulation is continuous. Both temperature and volume of air are automatically modulated, as required, to offset heat loss from each room.

For full information write Iron Fireman Mfg. Co., 3359 W. 106th St., Cleveland 11, Ohio. (In Canada, please address Iron Fireman Mfg. Co. of Canada, Ltd., 80 Ward Street, Toronto, Ontario).

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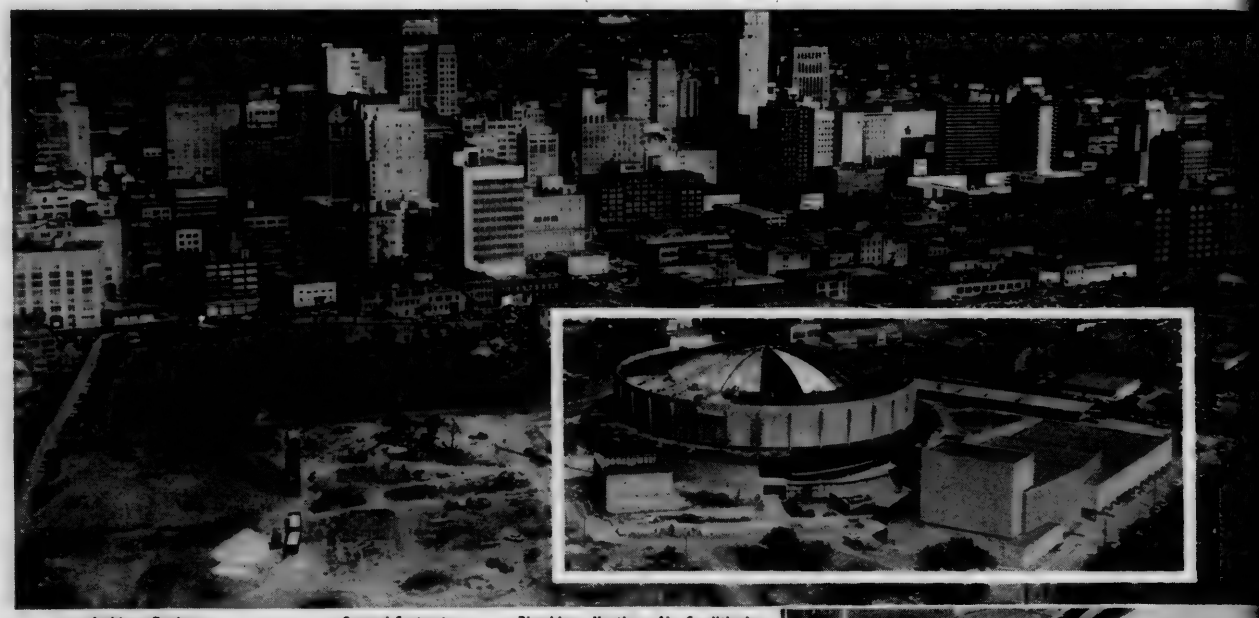

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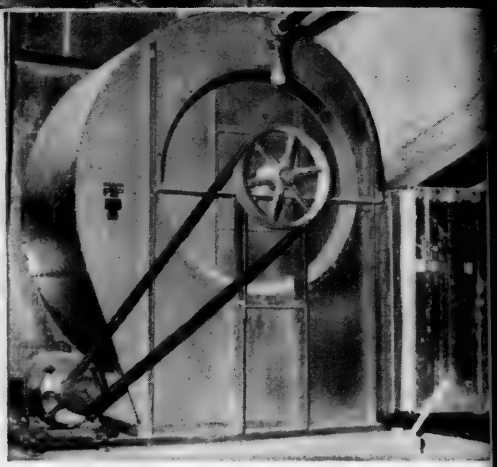
Another Coliseum Chooses Clarage Air Handling and Conditioning Equipment

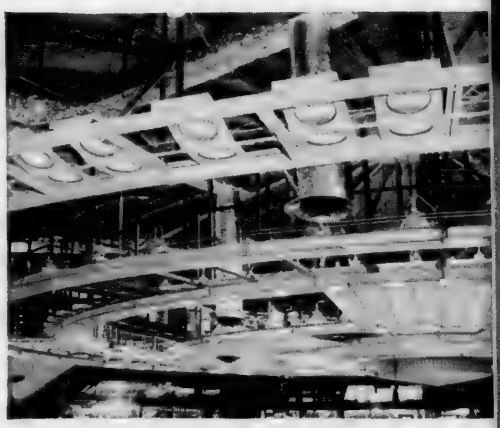
IMPRESSIVE in the Texas tradition is the new Dallas Memorial Auditorium. Its circular arena building, reportedly the largest cement domed structure in the nation, connects with a convention building and lyceum, shown on the right above.

Air handling throughout this vastness was assigned to Clarage equipment — Multitherm conditioning units, Unicoil sprayed coil units, giant system fans, ventilating sets.

Here again, as in New York's new Coliseum and other prominent buildings of all types, Clarage equipment was chosen for its recognized ability to perform quietly, economically, and dependably. CLARAGE FAN COMPANY, Kalamazoo, Mich.



One of several Clarage Type NH fans located in the outer ring which encircles the Coliseum's dome.



Arrangement of air conditioning ductwork, viewed before completion of the ceiling.

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THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS

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Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
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- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

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LARGE BUILDING EQUIPMENT SALES POTENTIALS FAVORABLE FOR 1958

Peter B. B. Andrews
Chairman, Future Sales Ratings Board

Economist, market-development counsel and speaker, Peter B. B. Andrews writes with extensive experience on the trends and sales potentials of the nation's many individual industries. He has contributed industry analyses to no less than 80 of the country's leading trade magazines, as well as sales projection-engineering studies for some of the country's top enterprises. Called to Washington by former General Motors president William S. Knudsen, who made him industrial economic advisor of the War Production Board, he received a Presidential Citation for his effective emergency research work on American industries during World War II. His Future Sales Ratings for Sales Management Magazine represent the world's outstanding quarterly series of forecasts (over two decades of forecasting on the 100-plus leading trades of the United States through his 307-man Board of Analysts of Future Sales Ratings, comprising Government and private industry economists, statisticians and marketing experts). Consulting economist of Sales Management Magazine, he also has been economic consultant of the National Production Authority and of the National Distribution Council of the Department of Commerce.

MUCH has been written and said recently of business declines and an unfavorable prospect for 1958, but the over-all consensus of the Board of Analysts of Future Sales Ratings projects for the year 1958 a level of potential sales in larger buildings of air conditioning, heating, ventilating, piping, plumbing and related equipment substantially above that of 1957. Reflecting these expectations, the Board's average estimates of business potentials in 47 categories of such equipment and supplies show varyingly increased sales possibilities in each of these products.

The projected sales gains carried in the accompanying tabulation are definitely attainable, in the Board's consensus views, unless the manufacturers and distributors of this equipment develop a defeatist attitude in sales development programs for 1958. In view of these future sales potentials and the Board's expectation that the air conditioning, heating, ventilating, piping and plumbing industries will increase their promotional programs to capitalize on the 1958 sales opportunities, the Board has assigned a future sales rating of five stars to these industries for 1958.

A rating of five stars is the highest any industry can get (signifying "Best Relative Outlook"), the gradations on lower sales expectations running down to four, three, two and one, the last of which represents the least favorable outlook in relation to other industries.

These ratings represent the common denominator determinations of the Future Sales Ratings Board, which comprises over 300 economists, statisticians and marketing experts in Government and private industry. It is the most experienced economic predicting panel on all the nation's industries in the world, having forecast quarterly in Sales Management for the past 23 years, with a favorable batting average of accuracy, the future-sales potentials of the 112 leading industries of the United States, of which the subject group of industries is among the economically most important.

Commissioned by "Air Conditioning, Heating and Ventilating" to survey the views of this Board and obtain its specific projections with respect to potential sales increases or decreases in 1958 for air conditioning, heating ventilating, piping and plumbing products, the writer, after consultation with the Board, has arrived at the following consensus estimates:

ESTIMATED POTENTIAL SALES CHANGES IN 1958 OVER 1957

Air Conditioning Systems	+12.7%	Humidifiers	+8.3
Air Diffusers, Grilles	+10.2	Instruments	+6.1
Bearings, Pillow Blocks	+6.4	Insulation	+7.8
Belting, Pulleys	+5.6	Pipe and Fittings	+4.7
Blowers, Fans	+4.4	Pipe Benders	+4.5
Boilers	+4.2	Pumps	+4.2
Burners	+4.9	Radiators, Convectors	+4.5
Coils	+4.4	Refrigerants	+6.4
Compressors	+4.1	Sheet Metal	+5.1
Condensers	+4.4	Spray Nozzles	+4.8
Controls	+5.6	Stokers	+3.1
Cooling Towers	+7.7	Strainers	+4.4
Couplings	+4.4	Switches	+4.5
Drying Systems	+8.8	Tanks	+4.1
Ducts, Fittings	+4.4	Tools, Hand & Power	+5.7
Dust Collectors	+4.2	Traps	+4.5
Electric Motors	+4.7	Tubing	+4.8
Filters	+4.5	Unit Coolers, Heaters	+5.0
Furnaces	+4.2	Valves	+4.5
Gages	+4.5	Ventilators	+5.3
Heat Exchangers	+4.7	Vibration Isolation	+5.9
Heating Surfaces	+4.5	Water Treatment Systems	+4.7
Heating Systems	+4.5	Welding Equipment	+4.4

These projections of potential sales increases over the next 12 months assume average advertising and selling promotion increases by this industry from manufacturer through wholesaler and retailer, but the Board feels that an even better sales improvement can be made if promotional programs are stepped up sufficiently to crystallize fully the forthcoming sales opportunities in this field. Conversely, it is felt that weak promotional programs would result in little or no sales gain over 1957.

Principal reasoning of the Board in estimating these favorable potentials of sales in 1958 is that — pessimists to the contrary — the general business prospect for 1958 is good; that the need for air conditioning, heating, ventilating, piping, plumbing and related equipment for larger buildings will be great in 1958, not only from the viewpoint of the great necessity for modernization of old plants but also from the standpoint of a big year ahead for new buildings.

The tremendous breadth of this market is indicated in the Board's estimate of $7.8 billion as the potential 1958 total value of the contracts for heating, ventilating, air conditioning, piping and related services in buildings other than homes. If there is deducted from this figure labor, overhead and other non-equipment charges, the value of equipment and materials likely to be bought in the next 12 months is estimated by the Board at $4.2 billion.

Despite widespread talk of reductions in new plant and equipment expenditures by businessmen and shrinkage in new building by the Federal Government, the Board anticipates a great building year in 1958, reaching in total the highest peak in history. Such reductions as are likely in new plant

and equipment expenditures by private business and in new Federal building are expected to be more than offset by increased State, municipal and private construction in such fields as schools, hospitals, churches, libraries, clubs, hotels, motels, camps, stores, TV studios, restaurants, garages, office buildings, warehouses, administrative, service buildings and public utility building, with the result that total new construction in 1958 is estimated by the Board as likely to exceed for the first time in the nation's history an aggregate of $50 billion, a rise of not far from 6% over the previous record year 1957, when the total was $47.2 billion.

The engineered deflation program of the Federal Reserve Board was ended late in 1957 as it became evident that tight money was exerting an overly depressing influence on industrial production, inventory accumulation, car buying, homebuilding, and expansion of new plants, buildings and equipment. The difficulty of borrowing money was reflected in a sharp drop of business loans and consequent planning for expanded business.

As part of the inflation battle which resulted in a general business sagging in some sectors of the economy, the Government also began clamping down on some of its expenditures, reasoning that less spending by Government agencies would bring a desired inflation antidote. That, too, had caused some businessmen to fear possible recession; but as in the case of tight money it is a passe economic factor, inasmuch as the Russian missile program has forced our hand. Now, instead of Federal spending as a whole being down several billion dollars, it is more likely to be up at least one or two billion dollars, even if this means that the U.S. Government debt ceiling will be raised.

The basic economic factors are of particularly great significance to the heating, ventilating and air conditioning industries since they sell to the cross-section of the American economy. Thus, in addition to the benefits to these industries from a great modernization need (with 62% of the industrial, office and institutional buildings estimated by the Board to be in need of some type of modernization) the stimulus is strong for rising business from a dynamically expanding and industrious population.

As of Jan. 1, 1958, total population of the U.S. approximates 172,600,000, compared with 169,800,000 on January 1, 1957, 166,805,000 on January 1, 1956, 163,956,000 on January 1, 1955 and 150,552,000 on January 1, 1950. The increase in the full year 1957 alone is almost the equivalent of adding another Detroit, Cincinnati and Indianapolis to the national market! The year 1958 is expected by the Board to see another great jump in our population, thus helping to maintain and expand its national market, and adding to the pressures and needs for improved and new buildings of all sorts.

A big prop to the economy's strength is seen in the high over-all level of employment and disposable income, despite some recent increase in unemployment. This is reflected in record-high spending in the consumer service trades and in retail sales, which are running substantially over last year. The present level of about $83 weekly earnings in manufacturing is at a record high, compared with $82.41 at this time last year, and an average of $71.86 in 1954 and $23.86 in 1939. The trend of wages, however, is up; and even though the extent of higher wages may not be as great in 1958 as in recent years the Board visualizes 1958 as another year of increased wages and salaries. Disposable personal income after taxes is expected to exceed $310 billion in 1958—up from $300 billion in 1957, $287.2 billion in 1956, $254.5 billion in 1954 and $70.4 billion in 1939.

Total gross national product (all the nation's spending for products and services) topped $435 billion in the full year 1957, a great new high. This compares with $414.7 billion in 1956, $361.2 billion in 1954 and $91.1 billion in 1939. For 1958 the Board estimates a gross national product of more than $450 billion—a new record, not far from half a trillion dollars!

Spending by businessmen declined in the first two quarters of 1957 as compared with 1956, but in the third quarter of 1957 came back even with the third quarter of 1956, to the record annual rate for that quarter of $65.5 billion. The Board looks for a firm spending trend by businessmen in 1958. Government purchases of goods and services hit a peak of $87.2 billion in the third quarter of 1957 (annual rate), but was scheduled to be cut substantially until heavy new missile spending was necessitated, with the consequence of record peacetime spending ahead. State and local governments are spending heavily too. Their purchases of goods and services surpassed a record $36 billion annual rate in the third quarter of 1957. The Board expects next year's spending by State and local governments to reach $39 billion, a new all-time high.

Not only is spending by businessmen, the people and government fundamental to the prosperity of the air conditioning, heating, ventilating and related industries, but so too is the financial condition representing basis for buying. Higher buying power has been spreading out in this country, giving it

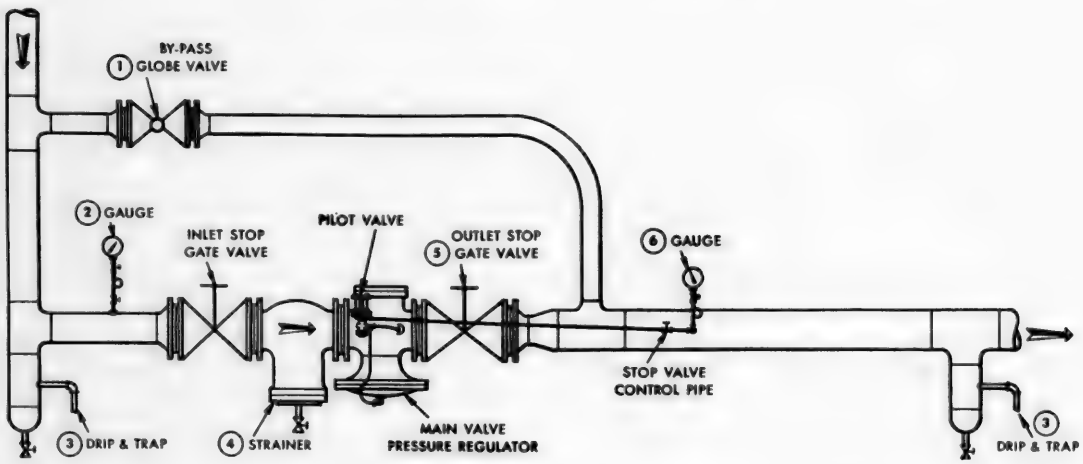
a broader cross-section of stability. About half of all families now get more than $5,000 annually, compared with less than a quarter at the end of World War II.

Besides disposable earnings being high, quick-asset position in the aggregate is close to a record. Individuals in the U.S. own more than $450 billion of such financial assets as cash, bank deposits, savings and loan shares, insurance loan value, and Government and municipal securities. In addition, they own over $300 billion of corporate securities, compared with individual mortgage and consumer debt of under $175 billion.

Similarly, American corporations' assets are growing and are now at a new high record. At the beginning of 1958 they are up substantially over the year before. Current assets total $234 billion, including $37 billion cash; current liabilities are $125 billion, leaving $109 billion net working capital with enough spare capital to buy a great deal of air conditioning, heating, ventilating and related equipment for modernization as well as for new building. At the beginning of 1957, by comparison, current assets totaled $225.7 billion, including $34.7 billion cash, and current liabilities $121.3 billion, leaving $104.4 billion net working capital.

All these estimates, figures and conclusions by the Board of analysts of Future Sales Ratings indicate expanding business opportunities in 1958. The alert and sales-expansive-minded people of the air conditioning, heating, ventilating and related industries, with their fine new lines of products for 1958, and with strategic and persuasive advertising and promotion, should be able to attain a sales level never before surpassed.

Mishandled Regulator Blows Up



Even a well-designed regulating station, as illustrated, can become a hazard through improper handling. One incident, which came to the attention of Spence Engineering Company, Walden, N. Y., involved a careless start-up.

Traps sufficiently large to carry off condensate as it formed in the hot system could not handle the large volumes brought to them on a fast start without the proper warm-up. Condensate was carried into the regulator with such force that the pilot blind flange blew off.

Placing a regulator on stream after a long shut-down, when the system is cold, should be done with care. The company suggests the following procedure: With the regulator isolated by closing the stop valves, heat up the down-stream line by admitting a small amount of steam through the by-pass. Then crack open the down-stream stop valve. Crack open the upstream valve which will admit steam to the pilot and open the main regulating valve.

Gradually increase steam flow until it is normal and is being handled by the regulator. If there is water in the system, the down-stream stop valve, when still throttling, will prevent water from entering the system. The stop valve will prevent the rush of uncontrolled steam into the system in the event that water hammer damages the regulator upon initial start-up.

Features of Axial Flow Fans

with notes on suitable applications

A. N. ROGERS
Sturtevant Division, Westinghouse Electric Corp., Boston, Mass.

Where conditions permit their consideration, the use of axial flow fans results in both low initial and installation costs. Information is presented on the types of fans available, advantages and disadvantages, characteristics, fan arrangements, and a discussion of suitable applications.

AXIAL flow fans probably have more versatility in design and performance than any other fan type. By definition, this type fan is one in which the air or gas flow is along the axis of the fan shaft. A screw or propeller-type action produces the air flow.

Types

The simplest type of axial flow fan is the propeller fan

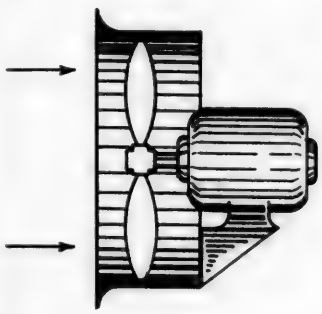
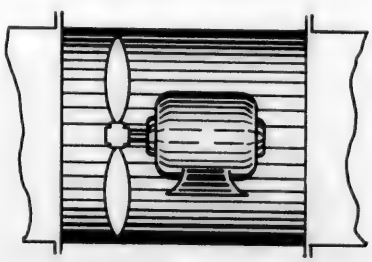


Fig. 1. Propeller fan is a simple axial flow fan.

which, in general, is designed only to produce air movement—to move air from one space to another without ductwork. See Fig. 1. Although falling within the general definition of axial flow fan types, the propeller fan as such is not considered to be a true axial flow type because it does not produce appreciable pressure. There are many so-called propeller fans on the commercial market which are rated at wide open volume and at pressure up to or beyond one-inch static pressure. These are also called "semipressure" or "duct" fans and can be considered to be an intermediate type which is between the true propeller fan and the true axial flow fan as in Fig. 2.

Fig. 2. A semipressure or duct fan.



The true axial flow fan is designed to produce pressure as well as movement. In other words, it is planned to produce volume flow against the resistance imposed by ductwork or other components of a system. These fans are divided into two basic types—tubeaxial and vaneaxial. The tubeaxial fan, Fig. 3, consists of a wheel or impeller mounted in a tube or cylinder and is designed to handle a wide range of volumes at medium pressure—generally up to static pressures of two or three inches of water. The vaneaxial, Fig. 4, is similar to the tubeaxial but with the addition of stationary vanes before or, in most cases, after the impeller. The action of the vanes of Fig. 4 is to convert the spin component of the velocity into useful pressure and to straighten out the air flow. Vaneaxial fans are normally used for higher pressure application, that is for those from two to six inches static pressure or higher.

Advantages

The inherent advantage of the axial flow fan is its simplicity. It is particularly adaptable to direct connection with the motor mounted within the cylinder, Fig. 5, or a V-belt drive with the motor mounted as a unit on the outside of the fan casing. Because of the straight through air flow and tubular construction, it is ideally suited to ductwork installation. It becomes essentially a part of the ductwork itself. This simplifies the fan erection and support and keeps installation costs as small as possible.

The simplicity of design keeps fan weight to a minimum, which in turn permits a lighter and less elaborate supporting structure than is required for centrifugal fan types. Their smaller size reduces the space required for the fan equipment, an important factor with today's high building costs. In general, axial flow fans will have a first cost considerably lower than a centrifugal fan of the same capacity.

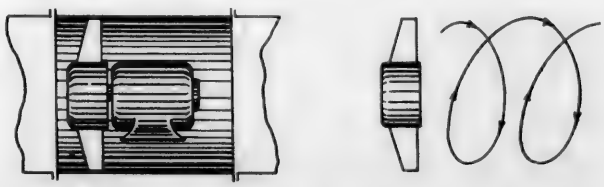


Fig. 3. Tubeaxial fan showing impeller and air pattern.

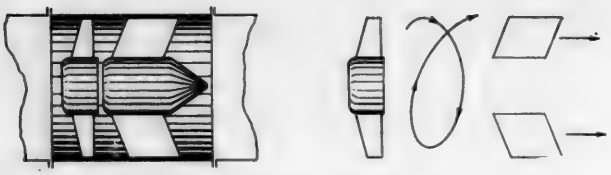


Fig. 4. Vaneaxial fan showing impeller, air pattern and position of vanes.

Disadvantages

The primary disadvantage of axial flow fans is that they are comparatively noisy. This factor has seriously limited their use in heating, ventilating and air conditioning applications in public buildings, although for most industrial applications it is no handicap. The noise level is further aggravated by the production of a distinct pitch note which, for most designs, occurs at blade frequency. Unfortunately, a pitch note is picked out by the human ear even though it is at the same or lower noise level than that of the surrounding area. To be on the safe side, a pitch note should be reduced 10 to 15 decibels below the ambient so that it will not cause annoyance.

In general, axial flow fans cannot handle solid material in the air beyond small quantities of fine, light dust. The twisting or spinning action of the air leaving tubeaxial fans makes separation of the air stream into distribution ducts difficult because the air will tend to spin into one duct and away from another. Direct-connected units with motors in the airstream are limited to temperatures and contaminants in the air or gas which will not damage the motor.

Characteristics

It is difficult to generalize about the characteristics of axial flow fans because of the almost unlimited possibilities for variation of their design. For this reason, characteristics which are labelled "typical" should be considered as generalizations for discussion purpose and subject to change in specific products.

On this basis then, we can consider over-all performance of the axial flow fans. In general, axial flow fans operate at high speeds with the pressure curve containing a dip where the blades reach a stall point. Figure 6 shows a typical characteristic curve. The horsepower is high at the blocked tight condition, dips as the pressure dips, reaches a second high point at larger volumes, then drops off again at wide open volume. The static and mechanical efficiency reach a peak in the large volume range. Typically, vaneaxial designs have exceeded 90% peak mechanical efficiency, whereas tubeaxial fans are usually in the lower range of 70 to 75%. Because peak efficiency normally occurs at the larger volume conditions, axial flow fans generally have a larger capacity for a given impeller diameter than centrifugal fans. The operating range is from the pressure peak (beyond the dip) to wide open volume (zero pressure).

Propeller or Duct Fans

Propeller fans are designed for peak mechanical efficiency to occur at, or close to, the wide open volume condition. The pressure curve is comparatively flat with the volume falling off rapidly as the pressure increases. The speeds are high in relation to other axial flow types. Horsepower either slopes constantly downward from zero volume condition or is a comparatively constant value throughout the volume range. Impellers have two or more blades often shaped like an airplane propeller. In general, greater numbers of blades produce a higher pressure resulting in less volume drop with the increased pressure. Peak mechanical efficiency is 60 to 70%.

Tubeaxial Fans

In contrast to propeller fans, tubeaxial fans are designed to build up an appreciable static pressure up to two to three inches. Peak efficiency occurs at a high pressure condition and emphasis is placed on static efficiency. Wheel blades are generally wider than those of the duct type propeller fans and, in most cases, their number ranges from three to eight. Wheels may be fabricated from sheet metal or cast. The relation of wheel hub size to wheel diameter is larger in comparison to propeller fans. Peak mechanical efficiency ranges from 60 to 75% and static efficiency from 45 to 60%. Comparative fan speed is lower than propeller fans and depends to a great extent on blade pitch.

Vaneaxial Fans

Because the vanes convert wasted spin velocity pressure into useful static pressure, the efficiency of vaneaxial fans is appreciably higher than their tubeaxial counterpart. Precision designs with cast airfoil bladed wheels and airfoil shaped vanes have reached mechanical efficiencies over 90% and have developed static pressures over 15 inches of water. Although seldom used in the United States, entering vanes may be employed to guide the air into the wheel. This arrangement may result in an ideal pressure characteristic, constantly rising from wide open to blocked tight. Variable entering vanes may be employed as a means of volume control.

Impellers and vanes may be either fabricated or cast. Hubs are usually large, ranging from 25 to 75% of the wheel diameter. In general, the higher the pressure the fan is designed to produce, the larger is the hub diameter for that fan.

Fig. 5. Direct drive axial flow fan with motor inside the casing.

Special Design

To meet exceptional performance requirements, other axial flow types are available. One of the most common of these is multiple staging or fans in series. This may be accomplished by the use of two or more complete fans, Fig. 7, or by two impellers on the same fan. If the two wheels rotate in opposite directions, the second stage impeller can be so designed that intermediate guide vanes are not required.

Often a motor with a double shaft extension is used with an impeller mounted on each extension and intermediate guide vanes surrounding the motor. Multistaging, Fig. 8, is generally employed to keep operating speeds and noise to a minimum for high pressure application. For ventilation work in mines, stages are added to the fan as the mine shaft is extended.

The blades of axial flow impellers are essentially airfoils, therefore airfoil modifications such as slots and flaps may be, and have been, used on fans to obtain particular performance characteristics.

Arrangements

As previously mentioned, axial flow fans are particularly adapted for use with the wheel mounted directly on the motor shaft. With this arrangement, however, speeds are, for all practical purposes, limited to a-c motor speeds. This often presents a problem in meeting exact working conditions, especially if the fan size range is limited.

Impellers can be designed to enable each blade segment, from hub to tip, to do the same amount of work and to build up the same pressure. In this case, the wheel can be cut off at any specific diameter to meet the volume requirements, and the casing built to suit. This method obviously requires considerable manufacturing versatility and does not lend itself to large production.

Another method of meeting various working conditions is to have the individual blades pivoted on the hub so that the blade pitch angle can be adjusted. The adjustment may be made at the point of manufacture and the blades fixed in position, or the blades may be adjustable on the job. The latter construction is more expensive but offers added flexibility to meet possible changing conditions after installation. Precision built fans are obtainable with pitch adjustment while in motion for volume control.

With direct-connected fans, the motor in the air stream offers problems when the gas to be handled is corrosive

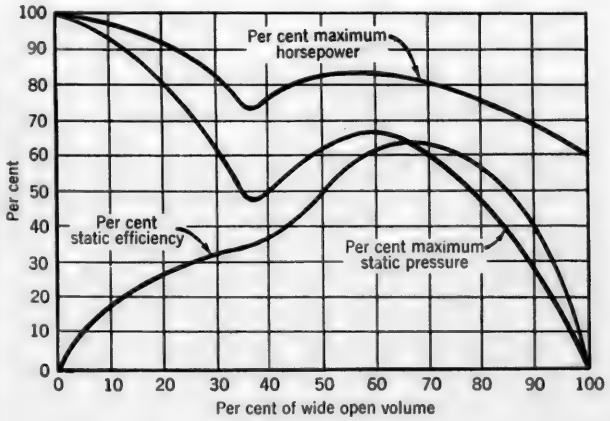
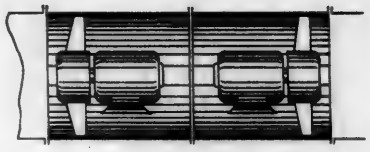


Fig. 6. Typical vaneaxial performance curve.

Fig. 7. Two complete fans installed to provide two stages.



or at elevated temperature. Special chemical-type motors or motors with high temperature insulation may be applied for mild conditions.

For more severe conditions, however, it is necessary to remove the motor from the air stream. In commercially available fans, there are two methods of accomplishing this for direct connected units. The fan can be built in an elbow shape with the motor shaft extending through the elbow, or the casing can be expanded at the motor section and the motor partitioned off from the gas flow as in Fig. 9.

Many manufacturers feature V-belt driven units with motors as an integral part of the unit or mounted separately. These fans offer speed flexibility to meet desired working conditions. The motor is generally mounted on the outside of the casing, Fig. 10, with the V-belt drive

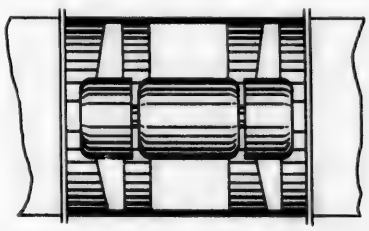


Fig. 8. Two stages with intermediate guide vanes.

extending through a tunnel in the casing to the fan shaft. By changing sheaves or using adjustable sheaves, the fan speed can be set to meet the volume and pressure requirements. The elimination of the motor from the air stream permits greater versatility of application. Such fans can be designed to handle corrosive fumes or gases at elevated temperatures.

A further adaptation of belt-driven fans is available for handling exhaust fumes from paint spray booths. These fans often employ greater clearance between the wheel and casing, simplified guide vanes and large access doors is the casing to facilitate cleaning.

Application Notes

Present-day axial flow fans have very high volumetric capacities. Thus, the fan may be capable of handling larger volumes than a duct of this same size. This means that unless a larger duct is used, the frictional resistance will be excessive. For this reason, the cataloged performance data of many manufacturers includes the effect of an expanded outlet cone which may be constructed or purchased as an accessory. This cone provides the dual function of expanding the casing diameter to the normal duct size and converting a portion of the outlet velocity pressure to static pressure. If the expanded outlet is not used, the performance data must be corrected accordingly. In order to meet the tabulated pressure and volume ratings, the fan must be speeded up and the horsepower increased. In the case of direct-driven fans which must

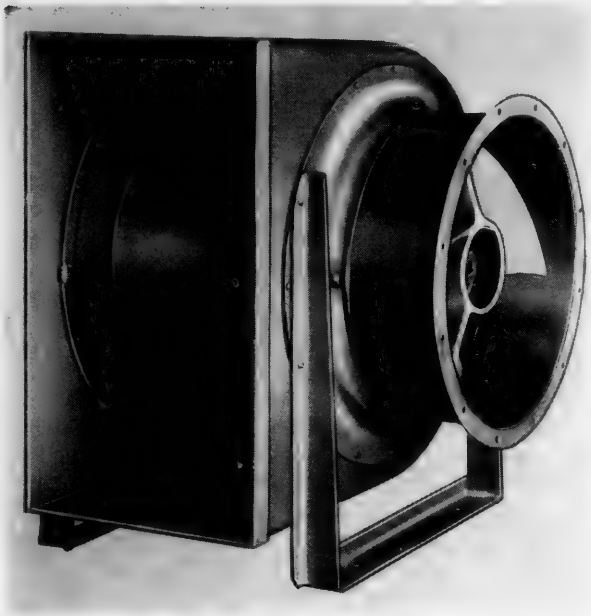


Fig. 9. Elbow axial flow fan.

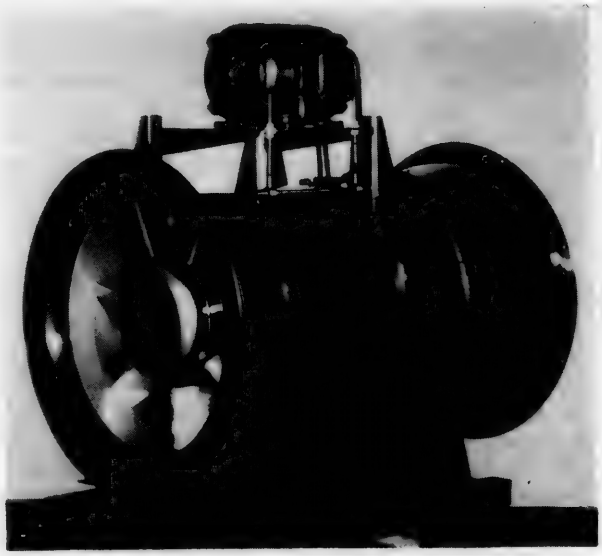


Fig. 10. V-belt driven fan with the motor mounted externally.

remain at constant speed, the volume for this application will be reduced.

Particular attention should be given to the fan horsepower characteristics whenever there is a possibility of the system flow being blocked off. This possibility could occur accidently as a result of adverse wind conditions or plugging, or deliberately through the use of a volume control device. If the horsepower requirement rises to a peak at the blocked tight condition, either the fan must be overpowered to meet the maximum requirement or suitable motor overload protection must be installed for the unit.

When the motor is in the air stream, the use of totally enclosed motors is recommended even when the air is clean. Totally enclosed motors give additional protection to the windings against the constant entry of atmospheric dust. Explosion-proof motors and fans with nonferrous wheels should be used when fans handle flammable mixtures.

Distribution ducts which divide the air flow should be at least ten duct diameters from the outlet of a tubeaxial fan to allow the swirling flow to straighten and prevent uneven distribution. Vaneaxial fans do not present this problem. Elbows or duct turns should also be kept well downstream from a tubeaxial outlet to prevent excessive friction due to the spin.

For commercial low pressure heating, ventilating and air conditioning systems, caution is advised in the use of axial flow fans because their noise level is generally higher than centrifugal fans. Their tendency to emit a distinct pitch note should also be taken into consideration. The space, installation and initial cost savings should be evaluated against the commercially available or custom designed acoustical treatment required to bring the noise level down to acceptable limits.

In Summary

Axial flow fans should be considered for applications where relatively clean air is to be handled and noise level is not of primary importance.

Their low initial cost, low installation cost and small size make them ideal for general, commercial and industrial air handling. Typical applications include fume and vapor exhausts; process and make-up air supply; industrial, mine and tunnel ventilation; paint spray booth exhaust; combustion air supply and product cooling or drying.

Addition of Attendant's Wage to Fuel Bill is Meaningless

When selecting a fuel for school heating plants, it is commonplace to add to the estimated solid fuel cost the wages of an attendant or, conversely, subtract a man's wages from the calculated cost of oil or gas. This is an erroneous calculation according to John D. L'Hote, supervising engineer, Board of Education, Detroit, Mich.

There is, at most, a differential of 350 to 400 hours' pay involved, based on experience in Detroit, says Mr. L'Hote. Writing in October-November issue of *School Planning*, he points out that of 2080 hours in the custodian's work year, there are 700 hours in which there are no operating duties in the boiler room. Of the 1400 remaining hours, safe practice demands that about five hours per week for 35 weeks will be required for checking automatically fired boilers no matter what the fuel. With stoker-fired coal, ten hours additional per week might be required to break up fires and take out ashes. The remainder of the attendant's time is available for other useful duties, including maintenance of mechanical equipment, cleaning his area, etc. Therefore, only 350 to 400 hours pay can reasonably be charged to the difference in fuels.

GATE, GLOBE, AND CHECK VALVES

(Continued from last month's Data Sheet)

Outside screw and yoke. A type of bonnet so constructed that the operating threads of the stem are outside the valve housing, where they may be easily lubricated and do not come into contact with the fluid flowing through the valve.

Packing. A general term describing any yielding material used to effect a tight joint. Valve packing is generally "jam packing"; it is pushed into a stuffing box and adjusted from time to time by tightening down on a packing gland or packing nut.

Packing gland. A device which holds and compresses the packing, and provides for additional compression by manual adjustment of the gland, as wear of the packing occurs. A packing gland may be screwed or bolted in place.

Packing nut. A nut which is screwed into place and presses down upon a gland bushing which transmits the force exerted by the packing nut to the packing. It serves the same purpose as a packing gland.

Rising stem. A threaded stem which is unscrewed or screwed through the bonnet to open or close the valve. The handwheel may rise with the stem, or the stem may rise through the handwheel.

Screwed bonnet. A type of bonnet so constructed that it attaches to the body by means of a screwed joint. It may screw over the body, or inside the body, or may be attached to the body by means of a union-type screwed connection.

Solid wedge. A wedge consisting of one solid piece.

Split wedge. A wedge consisting of two pieces, into which the valve stem is screwed to expand the two pieces against the valve seating surfaces to assure a tight seal when the valve is closed.

Stem. The usually threaded shaft to which is attached the handwheel at the top and the disc or wedge at the lower end. The stem may also be called the spindle.

Stop plug. An adjusting screw, extending through the body of a check valve, which adjusts and controls the extent of movement of the disc or clapper.

Swing check valve. A check valve which uses a hinged disc or clapper to limit the direction of flow. The pressure exerted by the fluid flowing through the valve forces the disc away from the seating surface. When the flow ceases, the clapper falls to its original position, preventing flow in the opposite direction.

Union. A coupling fitting, consisting of three parts (a shoulder piece, a thread piece, and a ring) used for coupling the ends of pipe sections. Adjoining faces of shoulder and thread pieces are lapped together to form a tight joint. Unions permit easy disconnection for repair and replacement of piping and fittings.

Union bonnet. Type of bonnet which is so constructed that the whole bonnet assembly, including the handwheel, stem and disc assembly, may be quickly removed by unscrewing the bonnet union ring from the valve body.

Union ring. The large nut-like ring which secures the union thread piece and the union shoulder piece together. It slips over and against the shoulder piece and screws onto the union thread piece.

Union shoulder piece. That part of the union which is fastened to the pipe and retains the union ring.

Union threaded piece. That part of the union which is fastened to the pipe and has external threads over which the union ring is screwed to effect a coupling.

Wedge. (See also "Disc".) The wedge-shaped device which fits into the seating surfaces of a gate valve and which is drawn out of contact with the seating surfaces to permit flow, or is pushed down into contact with the seating surfaces to close off flow through the valve.

Maintenance Methods

Maintenance personnel in their normal rounds are to remain alert to detect evidence of leakage and/or valve failure. When evidence of leakage and/or valve failure is detected, the inspection procedures described below are to be followed.

Gate valves. (a) Inspect the area around the top of the bonnet and stem for leakage.

(b) Inspect the bolted or screwed bonnet body connection for leakage.

(c) Inspect flanged or screwed connections for leakage.

(d) Check the action of the valve by turning the handwheel counterclockwise to open, and/or clockwise to close. Open and/or close each valve several times to make sure it is not corroded or jammed.

Make sure that the valve is returned to its original operating setting.

Globe valves. (a)Follow the procedure described for the inspection of gate valves.

Check valves. (a) Inspect the gasketed or screwed connections around the cap and both ends of the body for leakage.

Failure of the internal parts of check valves can not be determined by inspection, except by disassembling the valve. Do not disassemble any gasketed connection unless such disassembly is necessary for repair.

Trouble Shooting Methods

Trouble	Cause	Remedy
Gate Valves		
Leakage around stem	Loose packing gland or nut	Tighten packing gland or nut
	Packing worn out	Replace packing
	Bent or scored stem	Replace stem
Leakage around gasketed, screwed or soldered connections	Loose connections	Tighten flange bolts or screwed connections, or resolder joints
	Gasket failure	Replace gasket
Handwheel turns without stopping at extremes	Broken stem	Replace stem
Valve does not close tightly	Wedge damaged	Replace wedge
	Seat damaged	Replace valve
	Wedge-stem joint damaged	Replace stem and/or wedge
	Deposits under wedge	"Wash" or clean
Globe Valves		
Leakage around stem	Loose packing gland or nut	Tighten packing gland or nut
	Packing worn out	Replace packing
	Bent or scored stem	Replace stem
Leakage around gasketed, screwed or soldered connections	Loose connection	Tighten flange bolts
		Tighten screwed connections or resolder joints
	Gasket failure	Replace gasket
Valve does not close tightly	Disc damaged	Replace disc
	Seat damaged	Replace valve
	Disc-stem joint damaged	Replace disc or stem
	Deposits under disc	"Wash" or clean
Check Valves		
Leakage around gasketed, screwed or soldered connections	Loose connection	Tighten flange nuts or screwed connections or resolder joints
	Gasket failure	Replace gasket

Before Specifying Steam Coil Controls...

- Be sure valves are not oversized;
- Check for minimum drop from coil to trap;
- Provide a vacuum breaker; and
- See that condensate returns are pitched all the way to the boiler.

W. G. YOUNG
Manager of Product Engineering, Automatic Controls Division,
Barber-Colman Company, Rockford, Ill.

ALTHOUGH controls are the last items to be applied to an air conditioning system, they are in reality one of the most important, as even the most efficient system will deliver discomfort at any condition other than design.

Two types of control are applicable to air conditioning coils: the two-position or *on-off* type, and the proportional type. Two-position control fully opens or closes a valve. Proportional control positions a valve at some intermediate point to balance the load.

Two-position is the least expensive of the two, but its use is limited to certain applications. To illustrate the difference, compare them to the different means of regulating water temperature in a bathtub and a shower. The temperature of water in a bathtub can be adequately regulated by opening the hot water valve, then closing it, and then opening the cold water valve until the desired temperature is reached. Here two-position control gives excellent results due to the large thermal mass and slow temperature response of the water. If, on the other hand, this type of control were applied to a shower, the results would be disastrous, as the mass and thermal response is quite rapid. Applying this analogy to controls, it is concluded that in air conditioning applications two-position control can be applied to direct radiation, unit heaters, and certain fan coil units, while proportional control is applicable to air handling units, especially if outside air is used.

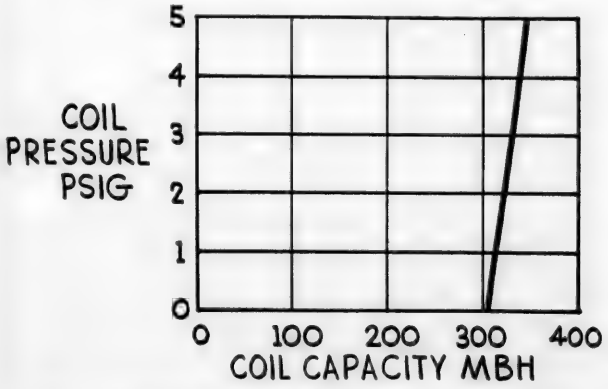


Fig. 1. Capacity is nearly constant as pressure varies.

How Valves Are Oversized

There are two ways to vary heat output when proportional control is applied to air handling unit coils. One is to control the flow of steam through the coil. The other is to vary air flow over the coil. When controlling flow through the coil, an important factor to consider is that of valve-sizing. In many cases an oversized valve transformed an otherwise good job into a poor one. Yet the tendency has always been to specify an oversized valve with consequent unstable and hunting conditions.

Low pressure steam coil ratings are often based on 2-lb steam. Yet, in referring to Fig. 1 below, it can be seen that there is very little difference in heat output, regardless of whether coil pressure is 0 or 5 lb. The difference lies only in the slightly higher steam temperature at 5 lb. On the other hand, it makes a great deal of difference controlwise, how great a pressure drop is allowed when the valve is in a wide-open position. If pressure drop is too small, and coil and piping are the major restrictions in the system, the valve cannot regulate steam flow to the coil in a linear fashion as is required. This can be illustrated by an electrical circuit, as shown in Fig. 2, equivalent to a coil, heat exchanger, and valve. This does not mean that fluids and gases follow the laws of electricity; however, their flow is similar enough to illustrate why the control valve must be the major restriction in the system.

If the valve were the only restriction in the system,

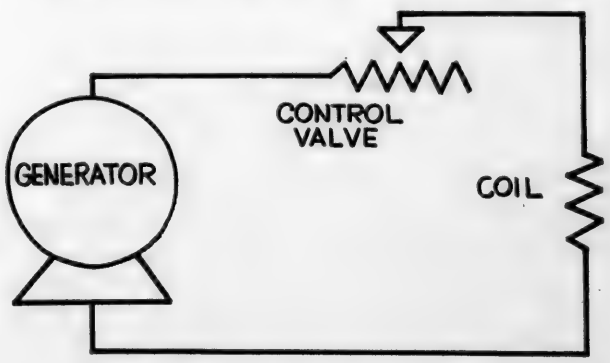
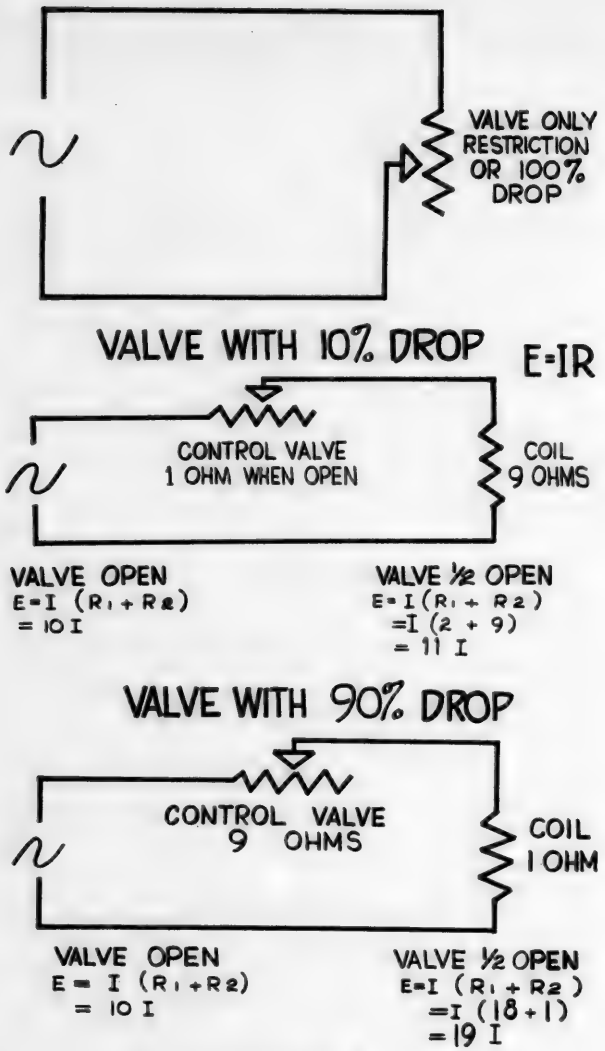


Fig. 2. Electrical analogy to steam circuit.



Top to bottom, Fig. 3, 4, and 5.

indicating a 100% drop across the valve as shown in Fig. 3, current would be a straight line inverse function of resistance. When a valve is sized so that it represents only 10% of the system's resistance at the wide-open position, Fig. 4, it can be seen that doubling valve resistance only changes current flow from 10 *I* to 11 *I*. A curve showing percentage flow vs. percentage resistance would be non-linear. Valve in Fig. 5 will result in almost linear control.

Valve-sizing charts of various control manufacturers do not give valve resistance directly, but do give pressure drop for a given flow. This is similar to giving voltage drop *IR* for a given flow *I*.

A typical sizing table, Fig. 6, shows a 2-inch valve with a pressure drop of 1 lb when handling 510 lb steam per hr. A 1½-inch valve, at about the same flow, will have a drop of almost 2½ lb. Thus, the smaller the valve, the higher its pressure drop for a given flow; hence, the greater its resistance.

A Little More Care with High Pressure

When sizing valves for steam coils with pressures below 10 psi, one should allow 80 to 100% drop for the valve. This makes the valve the major restriction in the system and results in good straight line control. On higher pressure systems, a little more care should be taken in choosing a pressure drop. It is still important that high drops be chosen. However, materially reducing maximum available pressure to the heat exchanger can have a more serious effect at higher pressures. A steam to water converter is typical. If the converter is sized for 30-lb steam, but the control valve drops the pressure to 10 lb, the converter may not have enough output for design conditions. This can be remedied by providing a higher boiler pressure in the design stage, so that a high pressure drop can be used and still have about 30 lb at the converter at design temperature. Lower pressure drops should be used only as a last resort.

Traps Need Head

Perhaps the second most important rule in coil control is that of good trapping. As large pressure drops are required for good valve control, there is little or no steam pressure in the coil even when the valve is wide open. As the valve closes down at reduced loads, the pressure in the coil can go below atmospheric. For this reason, one should not rely entirely upon pressure within the coil to eliminate condensate.

In many installations the condensate line comes out of the trap and rises two to three feet to pick up the return main. This results in very poor valve control, corroded coils, and a possibility of frozen or broken coils. Coils must be piped so that there is at least a 12-inch drop to the trap, and the drop must be full pipe size. The return mains should have a constant pitch all the way to the boiler. In addition, a vacuum breaker must be provided, because at reduced capacity condensation can take place at such a rate that the pressure within the coil can go below atmospheric. This would prevent condensate from draining even though the traps were open. Fig. 7 and 8 show proper trapping for low pressure steam, both vacuum and gravity return.

Turndown Ratio

Proportional control valves used in air conditioning work have a proportional range or turndown ratio of about 30 to 1. This means that if a valve is delivering 30 lb of steam when wide open, it could reduce the flow to 1 lb, but below this requirement the movement of the valve will not reduce the flow until the valve seats and stops the flow entirely. When controlling large coils, requiring large quantities of steam, better control can be had by using two control valves on the same coil.

Valve Size in Inches	2# Initial Pressure		5# Initial Pressure		10# Initial Pressure		15# Initial Pressure		25# Initial Pressure	
	Pressure Drop		Pressure Drop		Pressure Drop		Pressure Drop		Pressure Drop	
	1#	1.6#	2.5#	4#	5#	8#	4#	7.5#	6#	12.5#
½ (¼ port)	20	25	35	44	54	70	53	72	72	107
½ (⅜ port)	33	42	56	71	88	111	89	119	120	179
½	55	70	94	119	145	183	145	197	197	296
¾	80	101	134	170	210	268	210	285	290	430
1	130	165	225	285	340	430	345	465	480	695
1¼	228	289	385	490	600	760	600	805	830	1230
1½	315	400	535	680	830	1050	800	1140	1150	1680
2	510	645	895	1130	1370	1730	1340	1860	1920	2740

Fig. 6. Typical sizing table, single seat V-ported valves.

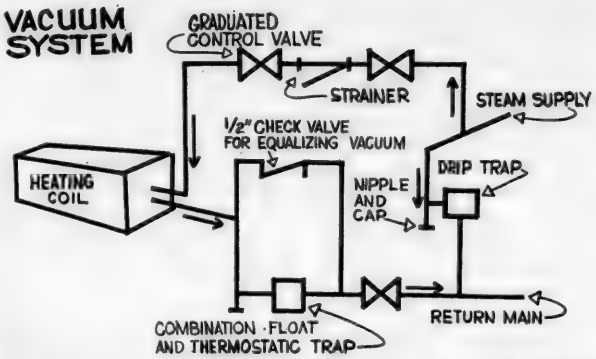


Fig. 7. Schematic shows proper trapping for low pressure steam, vacuum system.

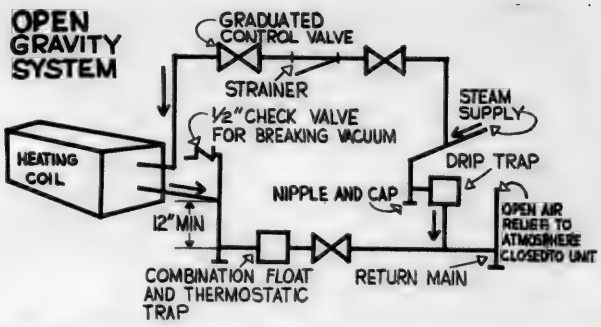


Fig. 8. Schematic shows proper trapping for low pressure steam, open gravity system.

The valves are usually sized so that the smaller of the two handles about ⅓ the total steam required. The control action is such that on a call for heat, the small valve modulates open first. If, when wide open, the heating effect is not enough, the larger valve modulates to open. This procedure is reversed on a call for cooling; the large valve closes first, and then the smaller one follows. Splitting the valves into two parts improves the turndown ratio of the larger system.

When controlling the flow of air over the coil, such as with a face and by-pass damper, a valve should always be applied to the steam supply. Ordinary dampers used in air conditioning work are not airtight, and consequently the space will overheat if the steam is not shut off after the damper is closed. Frequently a two-position valve is used, but it has some limitations. For example, if the air entering the coil is less than approximately 60 deg and there is a low limit thermostat or electronic element in the discharge side of the coil, then the two-position valve would cycle under light load conditions. But when a two-position valve closes, it has the same effect as the proportional control valve with the low turndown ratio; that is, it reaches the point where the heat is no longer reduced in a smooth line, but jumps to full *off*.

An analysis of the system is required to determine the most practical way of overcoming this. In some cases it can be accomplished by using a proportional control valve on the steam supply with the damper linked so that it does not close all the way when the control motor reaches the full cooling end, but allows a minimum of approximately 10% of the air to pass over the coil. The control sequence is such that on a call for heat, the valve first proportions open with 10% of the air going over the coil. When the valve reaches the wide open position, the damper will then start to proportion. This results in much smoother control at the light load conditions.

Summary

To summarize, when applying valves to control the flow of steam through a coil, the following rules apply:

On low pressure steam, a pressure drop of 80% and up should be used. This does not affect the heat output of the coil at design temperature.

On converters or high pressure coils (pressures over 10 lb) greater care should be taken, as a large pressure drop may materially reduce maximum heat output.

Proper trapping, in designing the control system, is essential because a proportional control valve allows little or no pressure within the coil to force the condensate out. Traps should be large enough with 12-inch minimum head. A vacuum breaker must be furnished, as the coil pressure can go below atmospheric. Condensate returns should be pitched all the way to the boiler.

Is 80-50 Realistic? Survey Casts Doubt

The majority of air conditioning users in all climate zones set thermostats at 76 deg F or lower. The longer they live with air conditioning, the lower they set the thermostat. More than two-thirds of the people set the thermostat to operate their cooling systems throughout the cooling season without manual interference.

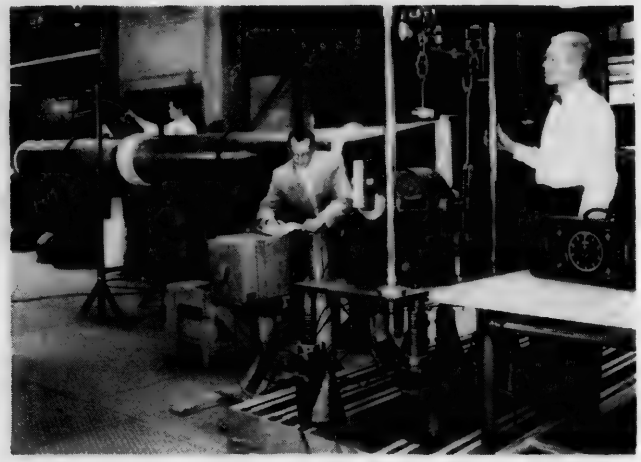
Above statistics were gleaned from a letter survey conducted by Mueller Climatrol, Milwaukee, Wis., a division of Worthington Corporation. Recipients of the questionnaire were selected from its warranty files and are representative of owners of its air conditioning equipment ranging in size from 2 to 7½ hp, located throughout the United States.

Prevalence of the 76-deg thermostat setting is in contrast to industry recommendations that air conditioning systems be designed for indoor temperatures of 80 deg (and 50% humidity). More than 90% of the respondents stated that their thermostats were set at less than 80 deg, with 2 out of 3 setting them at 76 deg or less.

Minority Report

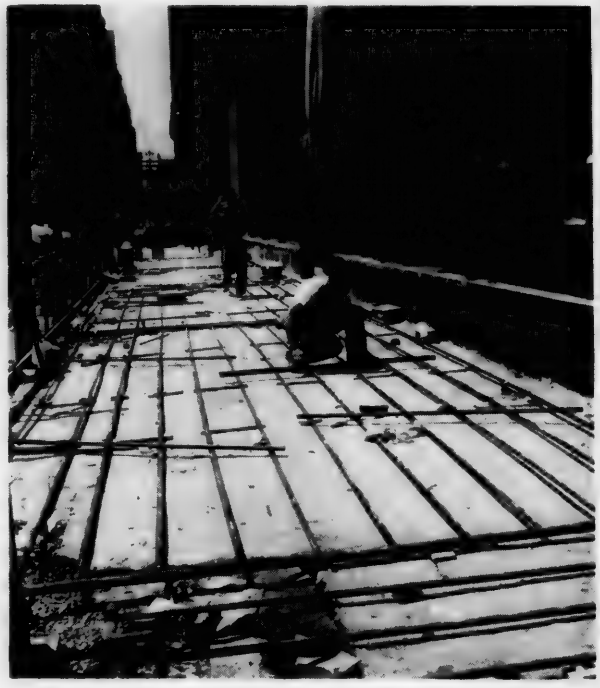
In response to 1760 questionnaires mailed, 778 replies were received. Of these, 1 out of 5 did *not* close windows and doors until outside temperatures exceeded 85 deg. Another significant minority (29%) wait until the house becomes warm before starting their air conditioners manually.

According to George M. Hase, Mueller's manager of sales engineering, analysis of survey data leads to the conclusion that major changes in sizing of air conditioning systems must be considered in the near future. "The consumer must also be properly informed as to how to obtain the best results from his air conditioning unit," he said.



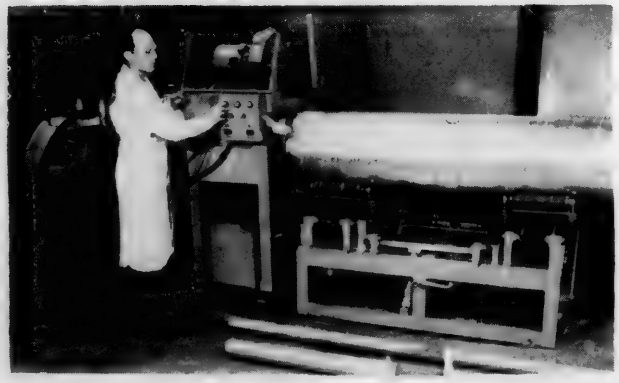
CERTIFIED RATINGS PROGRAM. (Left) Fan testing procedure is shown at the University of Detroit Test Laboratory, one approved by Air Moving and Conditioning Association for certification of ratings of air moving equipment. Centrifugal fan is being tested according to AMCA Standard Test Code. Man at right is checking input horsepower of motorshaft on dynamometer and beam scale; AMCA staff engineer (center) is examining results. At left, lab chief Y. W. Yamauchi moves pitot tube in test duct to obtain static and velocity pressures, and to determine air horsepower of the fan.

Picture Paragraphs



SNOW-FREE SIDEWALKS. (Right) Any inconvenience caused pedestrians last summer has been more than made up for during New York's December snowstorms by snow-free sidewalks outside new C.I.T. Financial Corporation building at 650 Madison Avenue. Shown here is part of network of welded steel piping (National Tube Div., U.S. Steel Corp.) through which light oil (Socony Mobil Oil Co., Inc.), heated to about 140 deg F, is piped when snow begins to fall.

IGLOOS AND PALM TREES. (Right) Closely patterned after the dome-shaped domiciles build by those enjoyers of natural air conditioning in the far north, these seven buildings have been constructed in Balboa, Canal Zone, Panama, by Oficinas Avenida Balboa, S.A., for rental as offices. Painted white to reflect heat, igloos are cooled by Chrysler Airtemp one-ton air conditioners. Visors over windows keep out tropical sun and rain.



DUCTMAKER DEVELOPED. Saving of 20% is claimed for this machine in cost of making cylindrical air conditioning ducts. High-pressure, high-velocity air pipe, from 3 to 24 inches dia, is spirally wound from thin-gage metal strip seen entering machine at left. Developed by Carrier Corporation, the apparatus also slices off desired lengths of duct without stopping production.

AIR CONDITIONING, HEATING and VENTILATING'S

REFERENCE SECTION

JANUARY, 1950

Maintenance and Repair for Induction Type Motors

J. W. SAMZELIUS and R. F. WOLL

Motor Engineering Department, Westinghouse Electric Corp., Buffalo, N. Y.

High Performance of Induction Motors Is Insured Through Proper Mechanical and Electrical Maintenance and Repair

Maintenance and Repair for Induction Type Motors

J. W. SAMZELIUS and R. F. WOLL

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The true measure of any industrial maintenance program is its effectiveness in preventing trouble. This is particularly true for induction motors because of their basic relationship to industrial production. Heavy financial loss is likely when motor maintenance programs are ineffectual. To forestall trouble, a program of preventive maintenance must obviously be built around a systematic and regular check of parts that are susceptible to deterioration and wear. Experience has shown that common operating troubles are grouped in three categories of roughly equal importance: Bearing troubles, winding, and all others. These are covered in this article.

INDUSTRIAL conditions provide factors that are adverse to good motor operation. Their possible effects on various motor parts are as follows:

Dirt or dust is damaging to bearings and insulation, and when ventilation and heat dissipation are restricted, winding failures can result. Another harmful consequence is the vibration that results when dirt causes unbalance of rotating parts. *High ambient temperatures* adversely affect the lubricant, the bearings, and the insulation. *Moisture or corrosive atmospheres* tend to rust and corrode motor parts and may destroy the lubricant. *Poor lubrication* is responsible for friction and excessive heat in the bearings; in turn these can cause additional heat in the windings. *Overloading the motor* may overload the bearings and may also cause excessive heat in the windings. *Vibration* may cause mechanical or electrical failure in any part of the motor.

INSTALLATION

Before installing a new induction motor, make sure that the motor has not been damaged during shipment or in storage. Turn the shaft through 360 degrees to see that the rotor turns freely. For motors with sleeve bearings, make certain that the oil level is adequate and that the oil ring follows the shaft. Check the nameplate to verify that the motor is compatible with the voltage and frequency of the power supply.

When mounting the motor, make sure that it can obtain all the ventilating air it may need; if protective guards or adjacent machines obstruct the free flow of air, the motor may not meet the specified temperature rise. Bolt the motor down to a rigid foundation using the largest bolts that the holes in the feet will accommodate. The motor must rest evenly on all four feet, which means it may be necessary to use one or more shims. When mounting motors with horizontal shafts, on a wall or ceiling, the end brackets of dripproof motors must be rotated 90 deg or 180 deg respectively to maintain normal dripproof protection. Grease-lubricated ball-bearing motors may be mounted at any angle so far as the bearings are concerned, but brackets for oil-lubricated ball- or sleeve-bearing motors must be rotated if they are to be mounted on a ceiling or wall. This permits the oil retention in the reservoir and allows oil flow to be properly influenced by gravity.

MOUNTING PROCEDURES FOR VARIOUS DRIVES

Belt Drives

Excluding direct connection, the most common means for transmitting power from the motor to a driven machine is by belt drive. Of a variety of belt drives available, the most common are the flat leather belt on crowned pulleys and V-belts on grooved pulleys. Regardless of the type involved, it is essential to protect the bearing at the pulley end from excessive loading, by making certain that the pulley is mounted near the bearing and that the belt (or belts) is not tighter than required for transmitting normal torque without undue slippage. Excessive tension shortens bearing life, may cause vibration and shaft breakage and, of course, overstresses the belt.

All belt drives should have a means for adjusting the belt tension. The most common and satisfactory means is by simple slide rails bolted to a solid foundation. Proper belt tension is best attained by adjusting the belt so that some slippage occurs at peak loads or when starting under load. High inertia in the driven machine is usually equivalent to start under full load. It should be emphasized that a belt which never slips is normally regarded too tight. When adjusting tension, it should be recalled that V-belts are designed to be run at less tension than flat belts since traction is obtained by wedging action in the tapered grooves of the pully. Because of the relatively great radial depth (thickness) of the V-belt, it must not be run on smaller pulleys than recommended by the belt manufacturer.

A convenient way to obtain varying speeds of the driven shaft is through use of variable pitch pulleys. Since such pulleys have about twice the face width of a fixed pulley for the same number of belts, and consequently overhang a greater distance from the bearing, it is important to have the bearing capacity verified by

the motor manufacturer before a variable pitch pulley is used on a standard motor.

Chain Drives

Chain drives are often used when it is necessary to synchronize the driving and driven shafts. Since a chain drive is even more susceptible to improper tension than is a belt drive, a sliding base is usually provided for easy adjustment. Once properly adjusted, the tension should be protected against tampering by unauthorized personnel. Since chains are subject to uneven wear if not aligned carefully, the chain must not be so wide that shaft deflection affects the alignment. The chain is usually enclosed in an oil-tight housing and runs in oil. At high speeds, drip oiling is recommended.

Gear Drives

When a motor is geared directly to the load, a common bedplate is usually employed and the motor dowelled in place to retain proper gear mesh. If spiral or helical gears are employed, the pinion must not cause excessive thrust load on the motor bearings. Ball bearings can usually sustain such axial thrust but sleeve bearings are apt to become overloaded.

Direct Drives or Coupled Drives

For these drives, the motor and the driven machine are also mounted on a common bedplate and dowelled in place to retain their precise alignment. Flexible couplings, which permit a reasonable amount of misalignment, are often employed for the connection but unless the shafts are closely in line, vibration and fatigue failures may result. It should be noted that pulleys, pinions or couplings must not be mounted by striking heavy blows unless precautions are taken to prevent reactions on the bearings. To protect the bearings from such forces, the shaft must be adequately backed up at the opposite end, Fig. 1.

Electrical Connections

When making electrical connections, it is important to verify that the voltage, frequency, and phases of the power supply agree with the nameplate rating of the motor. Although most motors will operate satisfactorily over a 10% variation in voltage or a 5% variation in frequency, their performance may not equal that established for operation at normal nameplate rating.

Fig. 1. When mounting pulleys, pinions, or couplings on the motor shaft, harmful bearing reactions should be prevented by backing up the opposite end of the shaft.

Motor lead connections should be made in accordance with the connection plate. A suitable switch and suitable overload protection are necessary for connection to the power supply; all wiring and fusing should observe the National Electric Code and local requirements.

When the motor conduit box is not tapped to receive rigid conduit, and the conduit entry is to be from above, the recommended method of connecting conduit is as shown in Fig. 2. Where conditions warrant, the same method may be applied to conduit entry from the sides. When the motor is mounted on slide rails for belt adjustment, flexible conduit should be used.

After connections are made, the motor should be operated without load to check the connections and direction of rotation. (To change the direction of rotation on three-phase machines, interchange any two line leads; to change the direction of rotation on two-phase motors, interchange the line leads of either phase.) Since large high-speed motors, and particularly those of the totally enclosed fan-cooled type have uni-directional fans, it is important that the direction of rotation of the motor and the driven equipment be properly matched.

IN-SERVICE INSPECTION PROGRAM

Although modern ball bearing motors require very little attention in service, a thorough inspection program of the entire motor should be carried out at intervals determined by operating conditions and the severity of service. Findings resulting from inspections should be recorded for comparison with similar findings at earlier or later inspections. This comparison calls attention to progressive deterioration in any part. Complete records of deterioration or wear will be very helpful in planning

J. W. Samzelius received an M.E. degree from the Chalmers Institute, Gothenburg, Sweden in 1919. After four years employment in the street railway field in Sweden he obtained a year's leave for additional experience in similar fields abroad and this resulted in a trip to the United States. In 1924 he joined the Motor Engineering Department of Westinghouse and he has now been there for 33 years. His chief interest has been experimental and development work in the mechanical field with particular emphasis on bearing and lubrication problems. He is the author of the section on Bearings in the Electric Motor in Plant Engineering Handbook and has written a number of magazine articles.

R. F. Woll joined Westinghouse following his graduation from the University of Pittsburgh in 1937. His early experience included motor testing and teaching at his alma mater. When the company's Motor and Control Division was transferred to Buffalo in January, 1946, he moved to that area. His activities have ranged from the design of motors to the development and manufacture of a new line of polyphase induction motors. He is the holder of a few patents. Mr. Woll is the author of a number of technical articles on both motor design and motor application.

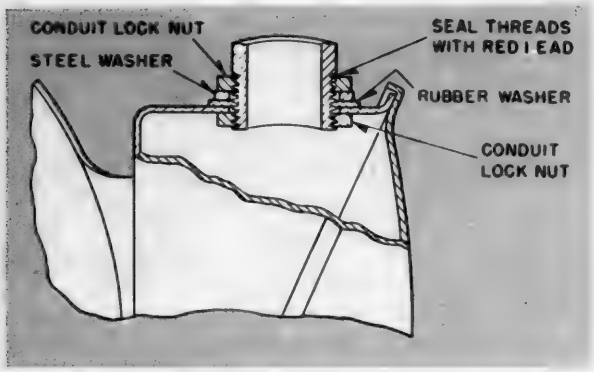


Fig. 2. Method of connecting rigid conduit to an untapped conduit box.

the number of renewal parts to be carried in stock for a given number of units.

Lubrication Schedule

Routine servicing operations, such as regular oiling or greasing need not be recorded but the person performing these operations should be instructed to observe and report conditions that may prove significant. He should, for example, check abnormal noises to determine their source and cause. When servicing the motor, he should look for above-normal temperatures, as evidenced by the feel of the frame or by the characteristic odor of overheated insulation. Excessive vibration may also be detected with the hand.

The oiler should be instructed to wipe up any oil that is spilled during oiling as this will make it easier to detect slow and continuous leaks through bearing seals or oil fittings. Cleanliness in general should be stressed since an accumulation of dust and dirt around bearings and ventilation openings may cause bearing and insulation failures.

Maintenance of Motors with Ball Bearings

Grease-lubricated ball or roller bearings, Fig. 3, are the types most commonly applied to modern industrial motors. One reason for this preference is the simple and infrequent lubrication schedule that may be employed.

Since the amount of grease required by these bearing types is very small, and an excess of grease is always wasteful and at times harmful, a number of motor manufacturers prefer to install sealed bearings, Fig. 4. Once given a lifetime charge of slow-aging or stabilized grease at the time of assembly, these bearings need not be regreased.

Sealed bearings are available only as deep-groove, single-row radial bearings (Conrad type) and only through the 315 size. The bearings are made in standard double-row width and are thus physically interchangeable with standard double-row bearings. In high speed applications, and in vertical motors subject to heavy thrust, oil-lubricated ball bearings of the deep groove or angular contact type are usually furnished.

Since the major differences between various types of antifriction bearings applied in electric motors are in mounting or provisions for lubrication, most troubles and remedies discussed here apply to all types of antifriction bearings.

Bearing Mountings

The simplest arrangement for bearing mounting results when pre-lubricated and sealed bearings are used in combination with a liberal end play for the rotor, Fig. 5. In this mounting, either bearing may take thrust. Thrust toward the motor is taken by the bearing at left, thrust away from the motor is taken by the bearing at right. The bearing housings can be extremely simple since the grease is retained inside the bearing and no provision is necessary for adding grease.

In a variation of this design a preloading spring in the form of a wavy washer is pressing against the end of the outer race of the front end bearing. The purpose of the spring is to put both bearings under a slight axial load and thereby reduce the noise typical of loosely-fitted bearings. Since loose bearings adapt themselves more readily to dimensional changes from heat, the loose bearing held in a steady position by a spring, is a definite aid in all high speed applications.

For greaseable bearings, the same type of mounting can be used although the housing is more complicated since it must retain grease and prevent entry of dirt. Again refer to Fig. 3.

The housing must also be provided with grease fittings and a drain for used grease. Some designs have sump space for the collection of the grease leaving the bearing. Such sumps must be drained or emptied at suitable intervals. Sometimes a grease pressure control is incorporated in the filling plug for protection against overfilling.

Where axial movements of the rotor are not permissible, the shaft extension bearing can be locked to the shaft by a locking nut or a retaining ring, and the outer race clamped in the housing by extending the nose of the inner cap to bear on the side of the outer race, Fig. 6. Since the opposite bearing must yield freely to all axial forces produced by shaft expansion it is not subjected to axial thrust.

End Play

Freedom for the shaft to expand with changes in tem-

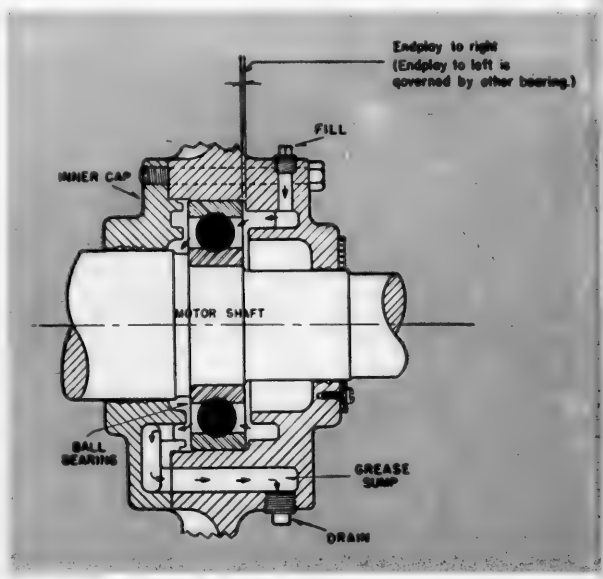


Fig. 3. Sectional view of a grease-lubricated ball bearing as used in induction motors.

perature is extremely important for proper bearing performance of the bearings, regardless of the bearing type involved. This is particularly evident for sleeve bearings, since the shaft is often seen moving from side to side.

For ball bearings, end play is just as important but this is not always obvious since the rotor may not move axially, even when both bearings are free to move. If one bearing is locked, the other must yield freely to any dimensional changes. Every motor should be checked for minimum safe end play before the motor is put in operation.

Minimum safe end play for any motor can be estimated by allowing 0.005 inch for every 12 inches of shaft between the bearings. In case of a floating rotor, the end play can be measured by pushing the rotor all the way first to one side and then to the other. Since this may require more force than can be exerted with the bare hands, a piece of timber can be used as a lever for moving the rotor, Fig. 7. Blows on the shaft with a mallet should be avoided since this may damage the bearings or the center of the shaft.

Sometimes it is necessary to limit the end play to less than the standard amount. (Proper functioning of the centrifugal switch in single-phase motors may be such a reason.) This can be done by inserting washer shims behind one bearing. If such washers are found in the bearing housing, it is essential to replace them as found in the final assembly. Where one bearing is locked to the housing, the locking bolts must be loosened to permit the rotor to move axially. By loosening the bolts only slightly more than is necessary for the end play desired, and by tapping the bolt heads back, the inner bearing cap will release the bearing for the test. The cap should always remain in engagement with the housing bore; when one is satisfied that the end play is right, the bolts are again drawn tight.

When End Play Is Insufficient or Lacking

If the brackets are hard to remove from the bearings, the difficulty may be due to: (1) the housing bore may be too small; (2) corrosion or rust may bind the bearing; or (3) the bearing housing may be distorted and thus be pinching the bearing at opposite points.

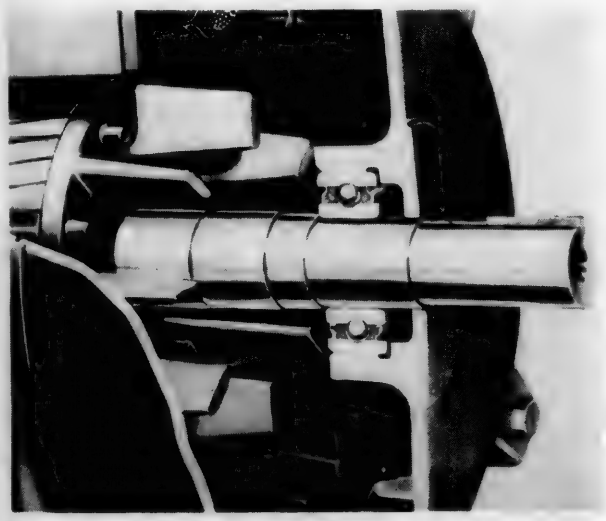


Fig. 4. A view of a prelubricated ball bearing as mounted in a squirrel cage motor.

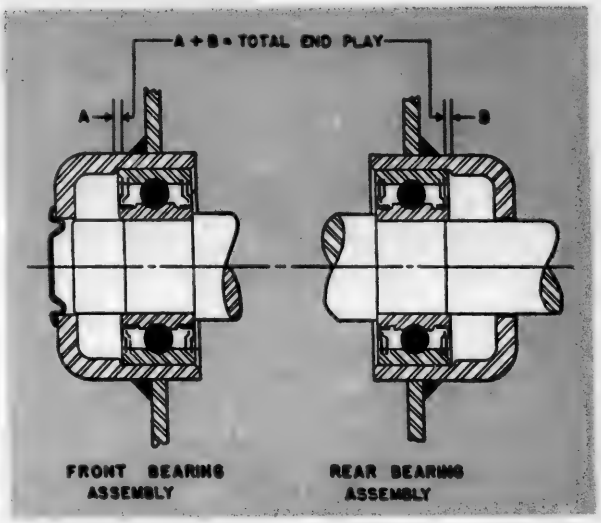


Fig. 5. Sectional view showing the geometry of end play in a motor equipped with prelubricated bearings.

In (1) or (2), the bore may be relieved or cleaned to produce a sliding fit with the bearing. In case of warpage or an oval bore, (3), the bracket or bearing housing should be replaced.

If the brackets come off easily after they are freed from the frame, a lack of end play is probably due to incorrect machining of the shaft, the brackets, or the frame. Incorrectly machined parts may result in a deficiency in end play or in misalignment and binding. The most serious type of thrust loading on the bearings appears if the bearings in the completed assembly are solid against the shoulders of both end brackets. The bearings might then even become preloaded when bolting the brackets to the frame. This condition may produce very high thrust loading on both bearings, especially after heat causes the shaft to expand. However, such extreme conditions are very rare. Routine testing by the manufacturer is certain to reveal such a condition before shipment.

If the fillet radii of the shoulders locating the bearing on the shaft and/or the fillet radii of the housing shoulders limiting the total end play of the rotor in the assembly are too large, Fig. 8, the bearings may locate against the fillets rather than against the shoulders proper, causing a condition similar to the one just discussed. A visual inspection of the fillets and shoulders should reveal whether the bearings are seated properly; if they are not, the faulty fillets must be corrected.

If the bore of the bracket is not true with the face of the rim, or if the ends of the frame are not parallel, the bearing housings will not be in line after the brackets are bolted up with the frame and the bearings may then bind in the housings. Any misalignment between the bearings tends to lock the bearings in the bracket bore and thus the check of axial freedom (end play) is a valuable aid in establishing approximate alignment. After misalignment and binding are established, a satisfactory remedy must be found. If, for example, it is found that the bracket rim of one bracket is running out with the bore, it can be trued up. Since this will shorten the bracket, the end play may be reduced to an unsafe value and it may be necessary to move the shoulder, which

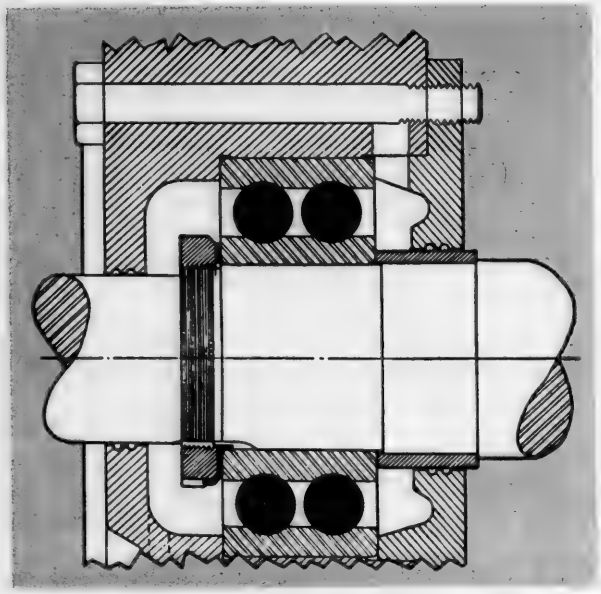


Fig. 6. When axial movement must be restricted, the shaft extension bearing can be locked to the shaft by a retaining ring.

locates the bearing on the shaft, by a corresponding amount.

Misalignment, caused when bearings are mounted in a cocked position, may be found by indicator readings against the side of the inner races. Misalignment may be due to a bent shaft. For such checking, the rotor may be supported by V-blocks under the bearings. This can be more convenient and accurate than using the shaft centers. A belt shaft can often be straightened but care must be taken to apply the corrective moments in the right places or the shaft may become permanently unsuitable for service.

Behavior of Bearings as Indications of Trouble

When a new or recently repaired motor is put in service, frequent checks of the bearings should be made during the first few hours of operation. These checks should include temperature measurements on the bearing housing or in the oil reservoir with thermometer. In about two to three hours of continuous running, the bearing temperature may be expected to level off at a temperature 10 deg C above the ambient temperature, and a replacetemperature of the bearing is ordinarily not important since it depends largely on ambient conditions. It must not, of course, be so high that the bearing materials are damaged or the lubricant suffers from sludging and rapid deterioration that occurs with increased temperature. On the other hand, the belief that a bearing is too hot when the motor is too hot to be touched with the hand is not a sure indication of bearing trouble.

At infrequent intervals all bearings in standard applications should be checked by thermometer and their temperature rise recorded. A replacement bearing can then be allowed an equivalent rise before corrective action is taken. If a certain bearing normally operates at only 10 deg C above the ambient temperature, and a replacement bearing runs at 20 deg above ambient, the replacement should be viewed with suspicion even though total temperature may not be alarming. A temperature limit of 85 deg C applies both to oil-lubricated and grease-lubricated bearings of both sleeve bearing and antifriction types in all normal temperature applications.

High temperature in ball or roller bearings may be caused by several factors. Among these are: (1) lack of lubrication; (2) excessive lubrication, resulting in too much agitation in the lubricant; (3) insufficient end play, resulting in high thrust load on the bearing; and (4) where normal expansion of the bearing is hampered by the housing. Condition (4) may be due to an undersize housing bore or due to rapid cooling of the housing which prevents the housing from expanding at the rate at which the bearing is expanding.

For these causes of high bearing temperature, various remedies may be applied. If, as in (1), the bearing lacks lubrication, the obvious procedure is to provide lubricants according to given instructions. If a lubrication schedule has been followed, it should be evident whether lack of lubrication is a factor. The noise emitted by a bearing lacking lubrication is usually harsh and grinding.

Excessive lubrication, as in (2), is a common reason for high bearing temperature and may be expected to cause the temperature to rise shortly after the bearing has been greased. It is significant that grease-lubricated ball bearings react in the opposite way to oil-lubricated sleeve bearings when the bearings are subjected to excessive lubrication.

An excess of oil in the sleeve bearing is never the cause of heat generation; oil not used for actual lubrication will assist in carrying away heat generated in the bearing. On the other hand an excess of grease or oil in ball bearings is a direct cause of heat generation in the bearing. It is often the cause for serious trouble. (Noise emitted by an overgreased bearing is usually of a whining or squealing character.)

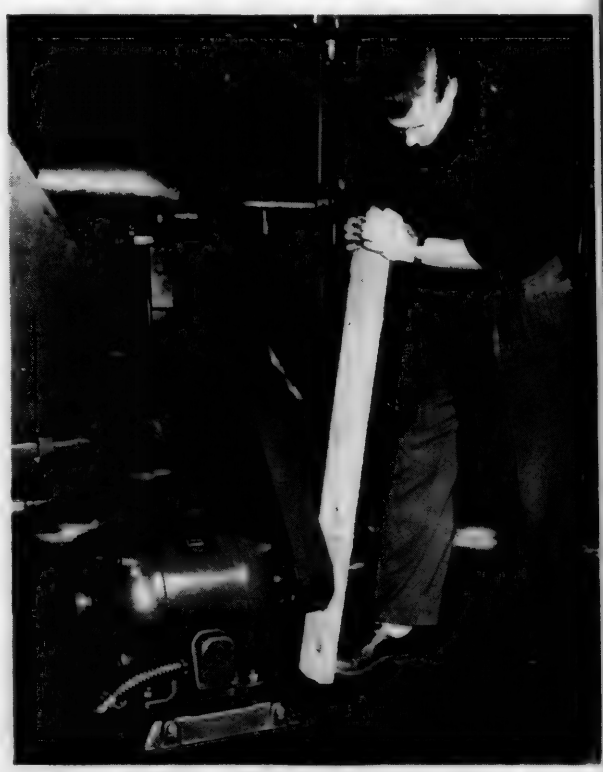


Fig. 7. Using a timber lever to determine end play.

The cure for an overgreased bearing is simply to relieve the bearing of its excess grease. In many instances this can be done while the motor is running merely by removing the drain plug provided in the bottom part of the housing. At times it may be necessary to aid the grease to drain out to speed up cooling.

Lack of end play, and the consequent heavy thrust load on the bearings due to normal expansion of the shaft, is a serious reason for overheated bearings. Both bearings are affected by the thrust and the bearing with the least capacity in the direction of thrust will be the first to fail. One simple but strictly temporary remedy, which can be applied without stopping the motor, is to loosen the bracket bolts at either end, being careful not to disengage the rabbet fit in the frame. An axial separation of only a few mils between the bracket and frame may relieve the thrust load and thereby reduce the temperature to a safe value. At the very first opportunity the reason for the binding must be removed and the loosened bracket bolted tight.

If the bearing housing restrains the bearing from expanding radially when heat is generated, the bearing may fail because of increased radial load. Greater internal looseness in the bearing tends to minimize such loading, hence the reason for going to looser bearing with preloading springs as mentioned earlier.

Increased pressure between the outer race and the housing, which is the result of uneven expansion in the two members, may also prevent the bearing to slide axially when the shaft is expanding in length. This condition is the same as outlined under (3) and may cause the bearings to fail in thrust.

From this it is obvious that attempts to cool a hot ball bearing by cooling its housing, which may be done successfully for a hot sleeve bearing, are likely to be disappointing and will probably speed ultimate failure. Antifriction bearings may be cooled safely by removing heat from the shaft; this may be done by directing an air stream against the shaft or against the couplings or pulleys adjacent to the bearing.

DIAGNOSING TROUBLES BY ANALYZING BEARING DAMAGE

The experienced engineer can often determine the reasons for trouble by examining the damaged bearing. Material defects, whether in the bearing proper or in the lubricant, can usually be determined only in the laboratory. Conditions such as misalignment, overload, damage in mounting, or damage from vibration or from electric current leave typical markings in the raceways that are easily recognized. To diagnose these troubles, it is essential that the bearing to be examined is not a complete failure, for if it is a complete failure, all evidence of the cause is probably destroyed. Likewise, the bearing to be examined must be removed from the shaft without additional damage to the raceways.

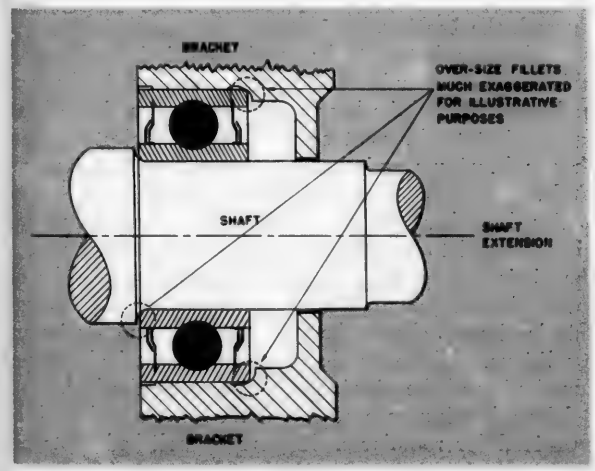


Fig. 8. End play is sometimes restricted excessively if fillets on bearing-locating shoulders have too large a radius.

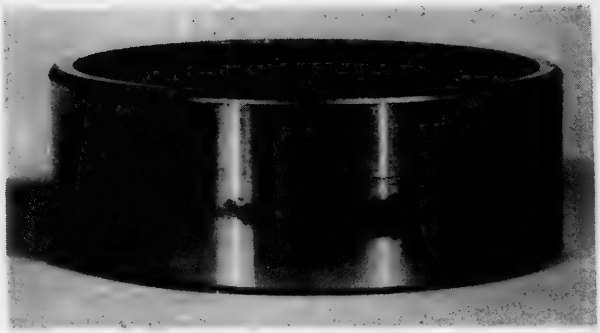


Fig. 9. A first sign of damage to bearings by vibration is discoloration and shallow pitting around the outside of the outer race.

Although it is unlikely that a damaged bearing can be restored to service, an examination is well worth the expense. By finding out what caused the bearing to fail, we can usually avoid repetition of the trouble. Since lack of grease, overgreasing, unsuitable grease, and dirt introduced with the grease are factors causing trouble, it is important to differentiate between *ordinary bearings* (bearings requiring periodic lubrication which are subject to these factors) and *sealed bearings,* from which these hazards are practically eliminated.

Some of the more typical indications or markings resulting from various causes are to be described. More detailed information, including excellent picture reproductions of bearing damage is published by The American Society of Lubrication Engineers, 84 E. Randolph Street, Chicago, Ill.

A bearing which has failed because of *lack of grease* will probably show discoloration due to heat. The heat may also have caused the small amount of grease contained in the bearing to burn and carbonize. This may be found as a black dry powder in protected places of the bearing. Such a bearing usually shows wear and will feel rough and loose in turning. It may also be very noisy prior to failure.

Overgreasing may also cause the bearing to run hot and fail. In this case one may find an oversupply of grease in the bearing. The grease next to the balls is probably mixed with carbonized grease to form a black, semisolid dough. Possibly, grease will also be found inside the motor where it may have caused damage to insulation. Moreover, the bearing will probably be discolored from heat.

Bearing failures entirely due to overload (not caused by misalignment or lack of end play) are rare since the useful life of a bearing under known load conditions can be predicted quite accurately. In belted applications, the

load is not definitely known and is sometimes greatly in excess of what is estimated as normal. Such conditions are usually due to poorly designed belt drives or careless belt adjustment and will result in unsatisfactory belt life as well as in bearing trouble. In coupled applications, the bearing loads are normally very light and the useful life of the bearings is ordinarily very long. However, if the line-up between shafts is poor, vibration and side load imposed by the misalignment may reduce bearing life to only a fraction of its expected value. Also, if the spacing between the coupled machines is not made properly, thrust loading on the bearings may cause unexpected failures.

Typical signs of overload are fatigue pitting or flaking in the area subjected to the heaviest load. If such pitting appears in the center of the ball track and is distributed all around, it can be concluded the bearing has been overloaded radially. If the pitting appears only in two diametrically opposite locations, the indication is that the bearing is squeezed oval by an oval housing. If the pitting is offset to one side, the fatigue is caused by thrust load, and if the pitting shows weaving from side to side, the bearing may be misaligned.

Hard particles or dirt may cause pitting in the raceways, but the marks are apt to be isolated and located irregularly. The edges of the craters are usually smooth and flattened in contrast to the edges of fatigue pits which are jagged and sharp. Damage from dirt is perhaps more common in the outer raceway, since centrifugal force tends to force heavy particles in this direction. Fatigue damage is more likely to show up first in the inner race since the balls pass a given spot more frequently in the inside track. A bearing containing hard particles will usually emit a variation of noises depending upon shifts in the location of the particles. When turned over slowly by hand, the bearing will feel rough and show a tendency to stick.

Infrequently bearings may suffer severe damage from abnormal external causes. One such cause is the circulation of an electric current through the bearing; another is vibration in the foundation during prolonged shutdowns or in standby machines. Instances of damage from both causes appear somewhat similar in that transverse dents or grooves may appear in the raceways. The grooves from electric discharges have dull surfaces and are distributed all around, resembling a miniature washboard. Dents resulting from vibration at standstill are spaced at the exact spacing of the rolling elements, primarily on the load side, and have shiny and polished surfaces.

Electric discharge may be due to static voltage built up by belt friction or by air friction in a dusty and dry atmosphere. It may also be due to voltage generated in the machine by an unbalanced condition in the magnetic field. Such unbalance may be caused by a shorted coil. Corrections may involve rewinding the machine or simply discharging static voltage to ground, or bypassing the bearings with a shunt from a collector on the shaft to ground. In pedestal-type bearings, it may be practical to insulate the bearings from ground.

An unbalanced load on the shaft can produce very destructive vibration forces which must be eliminated by proper balance of all rotating parts. The rotor is balanced on the shaft before the machine leaves the factory but pulleys or fans must also be in balance. A case of bearing damage that was caused by vibration is illustrated in Fig. 9.

Replacement of Failed Bearings

When a bearing has failed or shows advance indications of early failure, it must be replaced with a bearing of the same type as the original. Replacement bearings are preferably obtained through the motor manufacturer. Since commonly used bearings are standardized, interchangeable replacement bearings can usually be obtained locally.

When mounting the bearing on the shaft, pressure or blows must not be exerted on any part of the bearing except on the side of the inner race, using a squarely cut-off tube of slightly larger bore than the shaft and slightly smaller O.D. than the inner race. If the bearing is greasable it must be protected from dirt during installation. Grease of suitable type should be worked into the bearing from both sides using a clean wood paddle or clean hands. An additional quantity of grease shall be put into the housing next to the bearing but only about one-fourth or one-third of the housing space shall be filled in at time of assembly.

Sleeve Bearings

Instructions for maintenance of sleeve bearings may be considerably simpler than instructions for ball bearings, even though the time spent for maintenance itself is ordinarily much greater. Proper functioning of the sleeve bearing depends entirely upon the existence of an oil film between the journal and the bearing. The common method for supplying oil to the point of entry in the bearing is by an oil ring which dips into a reservoir of oil below the bearing and is rotated by the journal. If the ring should slow down or stop, or if the oil falls below a certain level, the oil supply will diminish and the bearing will probably fail.

At starting, the journal is carried directly by the bearing, without the benefit of an oil film. The number of revolutions required to establish the oil film depends on a number of factors. Among these are friction between the ring and the journal; drag of the oil on the submerged part of the ring; inertia of the ring; physical dimensions of the ring; the acceleration and final speed of the journal; and the speed at which the oil flows through the bearing.

With these factors to be considered, it is understandable that there may be considerable variations in the wear and useful life of the bearing. In general, a sleeve bearing subject to frequent starts is more subject to wear than a bearing running at uniform speed for long periods.

For sleeve bearings, it is important to use oil of proper viscosity and to give special attention to the oil ring if the oil is very cold when the motor is started. The oil must, of course, be maintained at a proper level, although this level may change between running and stationary conditions. Whenever the oil level is checked, proper functioning of the oil ring should also be checked.

When bearings are replaced, the oil ring should be examined for roundness. If worn or polished spots appear on the interior surface, it should be replaced. Proper functioning of the oil ring is so important that extreme care should be taken in checking and handling the ring when assembling the bearing.

Since sleeve bearings have very little thrust capacity, they must not be applied to a thrust load. Many coupled applications, not ordinarily considered as thrust loads, may produce thrust loading because of characteristics of the coupling. Gear and pin-type couplings with large end play between driving and driven elements may permit these elements to shift their relative position under the influence of vibration or other secondary forces that appear during idling or shutdown. When the coupling is transmitting full torque, friction between its driving and driven elements practically locks the coupling solid; if locked in an unfavorable position, thrust of considerable magnitude may develop. To ensure that such thrust loading does not develop, the coupling should be one with limited end play; that is, its end play should be only a fraction of the end play in the motor. For similar reasons, slip clutches and friction drives which are not restricted to very small axial adjustments may produce excessive thrust forces.

Sleeve bearings are usually provided with greater end play than ball bearings and since the shaft (rotor) is free to move axially, the end play is easily checked. This greater end play is important since axial magnetic forces on the rotor may balance out by a relatively small displacement of the rotor; thus thrust on the bearings due to magnetic forces may be avoided.

End Thrust

Unless thrust load from the magnetic forces can be proven to have caused bearing failure, a tendency for the rotor to run against the bearing should or should not cause alarm since the forces usually are small and well within the capacity of the bearing.

On the other hand, *external* forces such as the force from a misaligned belt drive or spiral or bevel gears are usually of greater magnitude and must not be permitted. If moderate and unavoidable thrust causes bearing failure an improvement can often be made by providing more oil for the thrust face of the bearing. This can usually be accomplished by extending the oil grooves to the thrust face and even across the thrust face. Restricting the oil drainage holes near the thrust face may also provide more oil where it is needed. The thrust shoulder of the shaft should also be smooth and polished to reduce friction and wear.

When steps are taken to provide more oil to the thrust face of the bearing, it becomes more difficult to prevent oil leakage to the interior of the motor. Therefore, the proper way to eliminate bearing trouble caused by thrust is to eliminate thrust itself.

Felt seals at the ends of the bearing are not intended to prevent oil from flowing from the bearing, but to prevent air currents from carrying oil mist into the motor. By preventing air circulation through the bearing, air-borne dust is also excluded. Air vents in the bearing housing, which are commonly provided in modern designs, equalize the pressure and thereby prevent air from passing through the bearings.

Sleeve bearings carrying heavy overhung loads (belt loads, for example) are often subject to load concentration at the outer end because of shaft deflection. Babbitt-lined bearings probably adjust more rapidly to shaft deflection than do bearings of harder materials but shaft deflection (bell mouthing) is a common reason for failure. If worn spots appear at the end of the bearing in the direction of the load, scraping the worn spot will distribute the load over a larger area. The belt load may also be reduced by lessening the initial belt tension.

TABLE I.—ALLOWABLE OPERATING TEMPERATURES, DEGREES CENTIGRADE

Motor Enclosure	Class A	Class B	Class H
Open	90	110	150
Totally enclosed, fan cooled	95	115	155
Totally enclosed, nonventilated	95	115	160

Preventative Maintenance of the Windings

Dirt, heat, moisture, poor lubrication, and vibration have been cited as the principal causes of mechanical failure of motors. And since poor lubrication usually produces heat and vibration, these same conditions prove also to be the chief hazards to the stator winding, and particularly to its insulation.

Dirt and air-borne dust can cause shorts and winding failures in various ways. It can impair the ventilation and lead to overheating. It can be responsible for insulation damage when it is carelessly removed. Dust that is free from oil and grease can be removed safely by wiping with a clean, dry cloth, but the preferred method is by suction. Pressure air may be used for blowing dust from inaccessible places but it should be clean, dry air of not more than 30 to 50 psi pressure.

When oil or grease makes the dust sticky, the wiping cloth should be moistened (not saturated) with a nontoxic petroleum solvent of the safety type, such as Stoddard Solvent. (When using these solvents, wear suitable gloves to prevent skin irritation.) Avoid unnecessary dismantling of motors for cleaning, especially in motors of the enclosed type. Since dirt cannot reach the interior of a properly designed enclosed motor, it is sufficient to keep the external surfaces clean and the air passages free and unobstructed.

In open motors of older design, which usually permit visual inspection of the interior, it is relatively simple to detect any heavy accumulation of dirt on the windings. Modern open motors of dripproof design may not permit similar inspection, but a heavy concentration of dust in the atmosphere and dirt deposits around the ventilation inlets may indicate that the interior needs cleaning. Even so, dismantling should be avoided unless other clues such as high frame temperature, odor of hot insulation, unusual noises, or a marked reduction in air flow are observed. The amount of dirt discharged from the motor when an airhose is inserted in the vent openings may also indicate whether the motor needs to be dismantled for cleaning.

Heat dries out insulation and causes it to age and crack. An old rule of thumb states that the life of insulation is reduced by half for every 10 deg C increase in temperature above normal temperature. Excessive heating may be caused by overload or by the poor ventilation that results when dirt or other obstructions hamper air flow or heat transfer. Heat may also be due

to high ambient temperature, in which case the insulation should be chosen to suit the condition (Class B or Class H insulation). Since excessive heat is most damaging and is relatively easy to detect by feel of the hand or thermometer checks, and the characteristic odor of overheated insulation, every effort should be made to remove the reasons for excessive heating.

Allowable operating temperatures, as measured by thermometer on the hottest accessible point of motor adjacent to insulation, are as listed in Table I.

Moisture lowers the insulation resistance of the motor, thus making the machine more vulnerable to shorts and grounds. Take care to protect dripproof motors from accidental hosing or deflected spray. Before blowing out motor windings with air, be sure that water has not condensed in the air line. Humid atmosphere will not normally cause trouble if the motor is running continuously since the heat generated in the windings will usually keep the insulation dry.

Standby motors should be protected from excessive moisture and the insulation resistance should be checked at regular intervals with a "megger" instrument to reveal the condition and presence of moisture. Although the megger is not a highly accurate instrument, and should not be used for absolute measurements of the insulation resistance, it is useful to obtain an indication of deterioration in the insulation. If the insulation resistance in a motor decreases appreciably, the windings must be dried before applying power to the motor. This is important where ambient temperature is subject to great and frequent fluctuations or where the atmosphere is exceptionally humid. In less severe locations, standby motors may be protected from moisture and condensation, if they are run for a period of a few minutes once a week.

Moisture is also detrimental to bearings and machined and unpainted surfaces. Take care that grease films provided to protect such surfaces in the motor assemblies are intact. Where moisture conditions are adverse, machined fits should occasionally be coated with a water-repellent grease. This grease should not be permitted to come in contact with windings or insulation.

Vibration is a common source of insulation and winding failures caused by mechanical fatigue. This hazard can affect both conductors and insulation. Since vibration is harmful to every part of the motor and is also very annoying to personnel, it should not be tolerated for any prolonged period. To avoid failures caused by vibration, a few simple checks should be made regularly:

1. Check for foundation settling or heavy floor loading (these may cause vibration by misalignment).
2. Check for excessive belt- or chain-tension, or shifts in the mounting due to the push-apart forces inherent in spur gearing.
3. Check the motor mounting bolts, the bracket bolts, and the pulley or coupling to be sure they are fastened securely.

Repair of Failed Windings

In spite of all precautionary measures, winding failures will occur from time to time and will require repair. The first step is to determine why the winding failed and then to remove the cause so as to avoid repetition. In smaller motors with mush-wound or random-wound coils a winding failure will generally require that the entire winding be replaced. The old winding should be carefully stripped, and all remnants of the insulation removed. For replacement, it is preferable to obtain a complete set of coils and insulation components from the motor manufacturer, since this takes guesswork out of the replacement winding and assures the use of materials of the proper quality and dimensions. If this is not possible, turns, wire size, connections, coil dimensions, and other data should be carefully noted so that the proper replacement winding can be made. It is imperative that insulation materials of satisfactory dielectric and mechanical strength be used.

Before starting the rewind job, the stator core should be carefully inspected; bent laminations should be straightened; and all rough or sharp edges should be

TABLE 2—OPERATING CHARACTERISTICS AND APPLICATIONS FOR SQUIRREL CAGE MOTORS

NEMA Design	General Operating Characteristics				Intended Usage	Typical Applications
	Locked Torque	Pull-out Torque	Locked Current	Slip		
A	Normal	High	Normal	Low	Infrequent starts with relatively light starting load; long running periods at normal loads with occasional short duration peak loads; continuous operation at slight overloads under certain conditions.	M-G sets, fans, drill presses, lathes, pumps, grinders, conveyors, machine tools, slusher hoists, compressors.
B	Normal	Normal	Low	Low		
C	High	Low	Low	Low	Infrequent starts with relatively heavy starting load; long running periods at normal loads, limited capacity for peak loads and overload.	Electric stairways, pulverizers, compressors, conveyors.
D	High	——	Low	High	Intermittent rated; frequent starts with heavy starting load and short operating periods.	Cranes, hoists, winches, valves, elevators.
					Continuous rated; light running loads alternating with frequent momentary peak loads; reversing service.	Punch presses, tapping machines.
F	Low	Extra Low	Extra Low	Low	Similar to Design *B* but where extra low locked current is necessary and low torques are acceptable; lack of torque margin restricts overload capacity; imperative that load requirements match the motor rating.	

smoothed in the areas contacting the slot cell. After the stator is wound, the coils should be snug in the slot, fillers being inserted if necessary. It is important to eliminate voids that can trap dirt or moisture, and to secure the coils against vibration.

The final and most important operation is to give the wound stator at least two dips and bakes in an insulating varnish of good quality. Suitable varnishes and information on their proper application are available from the motor manufacturers. The purpose of this varnish treatment is to fill all the voids and crevices in the winding, and to increase the dielectric strength of the insulation system. Much greater penetration of the varnish is gained by applying it by dipping or by the vacuum process, rather than by brushing or spraying. Hence, the former methods are strongly recommended. On a new winding, the insulation is fresh, flexible, and resistant to the deteriorative effects of moisture and agents. As the insulation ages, it shrinks, becomes brittle, and is much more liable to failure. Periodic cleaning, followed by varnish treatment, will combat this tendency and help the winding retain its newness over a long span of time.

For larger motors which use form wound coils, the same general comments apply but with certain differences: (1) individual coils that have failed can in many instances be replaced without rewinding the entire stator; (2) because of the more precise coil shape, it is highly desirable to procure replacement coils from the motor manufacturer; (3) the varnish dip and bake is applied to individual coils prior to their insertion in the stator. Hence varnish application to the wound stator by brushing or spraying is acceptable.

A good maintenance practice for stator windings is to be prepared for failures before they occur. When the motor is purchased, renewal parts data should be obtained from the manufacturer at that time. For motors in critical applications, it may be well to stock the renewal parts in the maintenance department; often it may be desirable to stock complete spare motors. Care should be taken that the storage area for such spare parts or motors is clean and dry. If not, the insulation on these spares may age almost as rapidly as that of motors in service.

Special Precautions

To maintain operation at rated load without exceeding the nameplate temperature rise, it is important that the normal motor ventilation be unimpaired. If any type of protecting enclosure is supplied, it must not obstruct the free flow of air around the motor. The ventilating passages of open and totally enclosed fan-cooled motors should be kept free and clean of dirt, nor should accumulations of dirt be allowed to blanket totally enclosed nonventilated motors, since this will hinder the dissipation of heat from the motor surface. Built-in applications should have the approval of the manufacturer's design engineers to be sure that adequate ventilation is attained.

Proper Application. Many motor failures are the result of misapplication. There are so many varied kinds of potential misapplication that it would take an extremely lengthy discussion to catalogue them all. In case of doubt, the motor manufacturer should be consulted.

Fig. 10. Instruments available for studying motor loading and performance range from the simple tong ammeter to this portable motor analyzer.

Some of the more obvious types of misapplication involve ambient temperature. Standard motors are designed to operate in a maximum ambient temperature of 40 deg C or 104 deg F. This ambient temperature should not be exceeded unless the motor has been specially designed or otherwise made suitable for this use. Motors with Class *B* or Class *H* insulation are usually required for high ambient applications.

For proper loading, it is necessary that the motor rating and the requirements of the load be properly matched. A simple tong ammeter is excellent for ensuring that load current agrees with the value on the motor nameplate, but more versatile and accurate instruments are at times desirable, Fig. 10. The nameplate of many 40 deg rise motors will indicate that they carry a "service factor," which means that the motors can safely be overloaded by a stated percentage of rated load. In the range of loading thus allowed, the increase in operating current will vary directly with the increase in load.

In the area of proper electrical design, there are a number of basic designs of induction motors, each suited to a particular field of application by reason of its specific performance characteristics. It is important that the motor design and the application requirements be mutually compatible.

As a guide to correct application, the general operating characteristics of each squirrel cage NEMA design motor, together with their principal applications, are shown in Table 2.

Violation of these application rules can cause motor failures, and departures therefrom should be avoided unless approval of the motor manufacturer has been obtained.

Proper mechanical enclosure for the application is also important. There are two broad enclosure classifications, open and totally enclosed; each is divided into more specific subclassifications. The most common error made with enclosures is to install open motors in locations that require the use of totally enclosed motors. While open motors are priced below enclosed motors

and are adequate (indeed preferable) for many industrial and most commercial purposes, they do have limitations. To cool an open motor, external air is drawn in through the ventilation openings and made to pass over and around the windings. Open motors should be used only where the air contains nothing that might be harmful to the interior of the motor. A certain amount of dust and dirt can be tolerated, providing the material is not conductive or the dust is severely abrasive or corrosive.

Although the squirrel cage induction motor is highly rugged, proper care should be exercised for dismantling and subsequent reassembly. The use of chisels and similar sharp-pointed instruments should be avoided in removing the end brackets; after the bolts are disengaged, a few light taps with a rawhide mallet should suffice to release the brackets from the frame. Be sure that bolts holding inner bearing caps are removed before trying to withdraw the rotor. Do not attempt to pull an oversize internal fan through the stator bore; instead, remove the rotor from the opposite end. It is important to become familiar with the construction details of a particular motor by reading the manufacturer's instructions before starting to dismantle.

A most important point is to take care that the rotor is not bumped or scraped against the end turns of the stator winding when it is being removed from or inserted in the stator. If the rotor weight is such that it is awkward to manage by hand, use a crane lift to handle it in or out.

On sleeve bearing motors, drain the oil reservoirs before dismantling. On ball bearing motors, protect the bearings of a dismantled motor from dirt, dust, and moisture, particularly if the bearings are of the open type. Avoid touching the bearings or other polished metal surfaces so that the moisture from your fingers will not attack the surface. Good housekeeping, cleanliness and care are just as important in the maintenance shops as on the production line, possibly more so because the vulnerable internal parts of the motor are exposed.

The combination of electricity and rotating parts in the electric motor requires strict adherence to common sense safety rules to avoid injury to personnel. Wear goggles when blowing out dirt; wear gloves when handling cleaning solvents; avoid prolonged exposure to toxic fumes; take care that flammable solvents are not ignited. Suitable precautions are necessary not only to protect those who maintain the equipment, but also to protect those who operate it.

Health Effects of Air Pollution

Since the London and Donora air pollution disasters, public health workers, among others, have shown substantial concern about the health effects of air pollution. This concern extends not only to the possible repetition of such episodes in various cities of the world, but to the immediate adverse effect of air pollution on human well-being, and also to possible long-term effects.

In a paper on Health Effects of Air Pollution, by Dr. Lester Breslow and Dr. John Goldsmith, Bureau of Chronic Diseases, California State Department of Public Health, that was presented at the 1957 annual meeting of the American Public Health Association, the authors said:

"If we are to attack air pollution as an environmental influence detracting from health, as well as causing disease and death, then it seems desirable to measure the extent to which it does interfere with well-being."

In California during the summer of 1956 the State Department of Public Health sought information on this question through personal interviews with adults in 3,545 households—a representative, statewide sample of the population. About two-fifths of the respondents reported that they were bothered by air pollution. (1) In Los Angeles County the proportion was two-thirds, in other parts of the state about one-fifth. Most persons complained about eye irritation, with nasal symptoms next in frequency.

Delayed health effects of air pollution have presented the epidemiologist with some difficult problems. Consider lung cancer. The current emphasis on the idea that cigarette smoking causes a large amount of lung cancer should not distract public health workers from efforts to determine other etiologic factors.

As a matter of fact substantial evidence now supports the notion that community air pollution may be another important factor, both in the United States and Great Britain. Lung cancer affects city-dwellers to a much greater extent than it does residents of non-metropolitan areas.

In addition certain experimental data bear on this question. Substances found in the air of Los Angeles will produce cancer in mice as will extracts from motor vehicle exhausts. Moreover chemical studies have demonstrated the presence of benzpyrene (one of the most potent known cancerogenic substances) in the air over many cities in the world. Incidentally, the British have progressed far beyond this country in studying this hazardous material in the air.

Thus experimental and chemical evidence converges with epidemiologic evidence to compel serious consideration of the role of air pollution in lung cancer. Analysis of the rising lung cancer rate during recent decades and evidence pertaining to causative factors in the past make us realize that the full impact of present environmental exposures may not be felt for 30 or 40 years.

Another disease which appears to represent a long-term effect of air pollution is chronic bronchitis. In Great Britain the death rate from this disease is 34 times as high as that recorded in the U. S., i.e., about as high as the death rate from accidents in this country. British investigators have demonstrated that the mortality from chronic bronchitis is higher in the urban communities which have greater amounts of air pollution. Recent studies in London also reveal definite aggravation of symptoms among patients with chronic bronchitis during periods when atmospheric smoke and sulfur dioxide increase. Moreover, the air pollution disaster of 1952 affected particularly older persons and many of the excess deaths were attributed to chronic bronchitis. All of this evidence points to a profound effect of air pollution, as experienced in Great Britain, on the course, if not the origin, of chronic bronchitis.

Design and Features of Traps

Covered in Part 2 of this article are the various types of upright and inverted bucket steam traps. The design and operating features of these steam traps are described.

ONE does not have to go to the patent office to become confused by the many variations in bucket traps.

Bucket traps are of two types, upright and inverted. The upright type is also referred to as vertical, open float, open top, or open bucket, because the bucket floats with open end up, while the inverted type is sometimes designated as open bottom, because the bucket is inverted or suspended with open end down. Bucket traps are further referred to as mechanical traps, because the discharge valve is operated mechanically by a float or bucket regardless of temperature. Discharge is at steam temperature, thus increasing the tendency to flash.

Vertical Open Top Bucket Traps

A vertical open top bucket trap, Fig 16, functions by the direct vertical movement of an open top bucket which opens and closes the valve *V* as the bucket falls and rises.

When condensate enters the trap at inlet *A* and fills the bucket, the bucket drops because of the added weight. During the discharge operation when water is discharged from the bucket up the pipe *P*, the bucket becomes buoyant again and rises.

The area of the valve *V* is governed by the direct weight of the bucket as there is no lever mechanism to obtain a mechanical advantage or to increase power. Sometimes these traps are also designed to give the bucket a free vertical movement so that it falls a given distance before it engages the rod *R* on the discharge valve *V*. In this way it utilizes its momentum to help jerk the valve from its seat against the internal pressure.

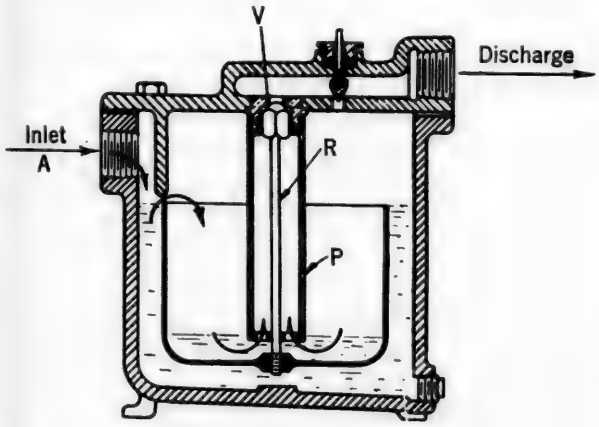


Fig. 16. Details of a vertical open top bucket trap.

A type of open top bucket trap where the bucket is hinged internally is shown in Fig 17. This particular trap has an automatic air vent.

In the upright bucket trap, the bucket may be direct acting, that is, more or less free floating, Fig 18, or it may be lever connected, Fig 19, to provide a mechanical advantage. Since leverage is restricted, the bucket must be large enough for weight of condensate to sink it against steam pressure acting to keep the valve closed. Therefore, the lower the steam pressure, the more condensate this trap can handle.

No condensate is discharged while the bucket is filling, hence discharge is normally intermittent. The bucket cannot collapse or waterlog as with a float. It is less liable to leakage, and with only a small leak, will continue to operate. Action is reverse to that of a float trap,

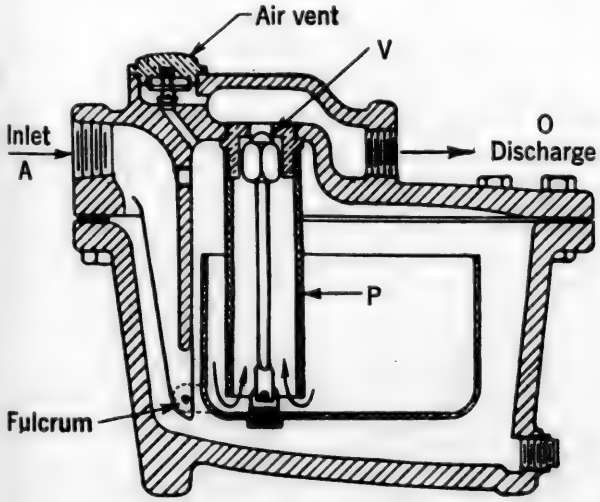


Fig. 17. Open top bucket trap with bucket hinged internally.

Fig. 18. Free floating upright bucket trap.

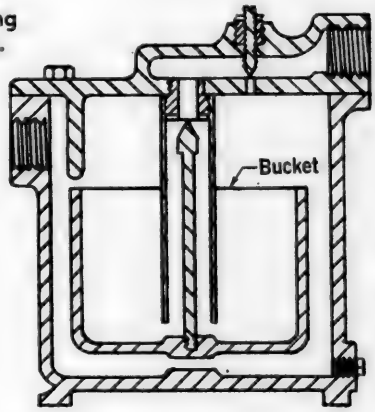
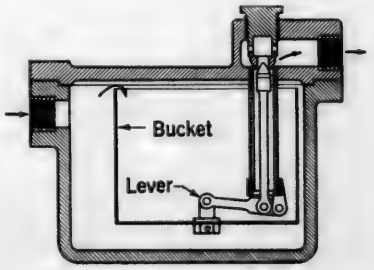


Fig. 19. Lever connected upright bucket trap.



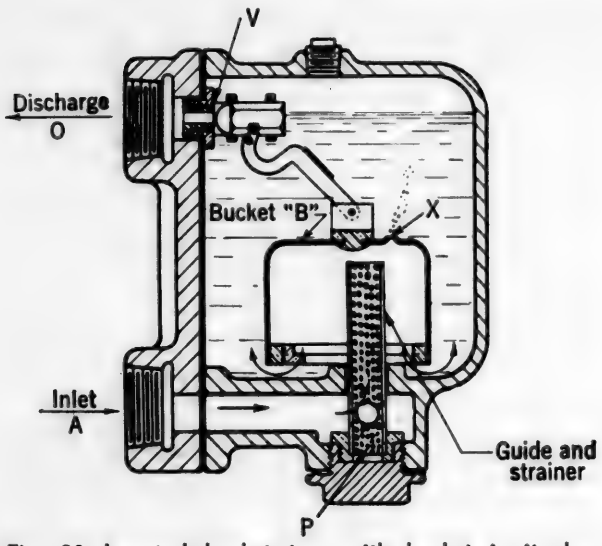


Fig. 20. Inverted bucket trap with bucket in its low position.

since buoyancy closes the valve and weight opens it. The bucket does not fully discharge its contents, some condensate being retained to form a water seal.

In an upright bucket trap, the bucket may float and close the valve before all of the air escapes. If vented manually through a bypass, steam may be wasted and if vented manually by an opened air cock on the trap body, greater amounts of steam will be wasted. The opened air cock recognizes no difference between steam or air, but blows one or the other, or both. It does, however, benefit a process, and if briefly used, steam wastage is limited. A thermostatic air vent can be used to vent the trap automatically when there is no steam in the trap to close it. The vent also serves to pass condensate at peak loads.

In some cases dirt may collect in the bottom of the bucket, the top being wide open, as with a dirt pocket, thus causing it to lose buoyancy and thereby interfere with operation, especially so with the direct acting type which lacks the power of the inverted bucket trap. Some bucket traps have the inlet and outlet on the same plane. This allows the return line to be run higher and avoids the use of a bottom inlet. It is said that surges of condensation cannot raise the bucket to prematurely close the discharge valve. Some thought should be given to possible noisy trap action, particularly where quiet operation is most essential. Noise is possible where a trap is mechanically and intermittently operated.

Inverted Bucket Traps

There are many different types of inverted bucket traps on the market working on the same principle. An inverted bucket trap is very suitable for high steam pressures, also where corrosive agents exist in the condensate. Special metals can be used in trap construction to withstand corrosion and high steam temperatures.

In Fig 20, a typical design, the bucket *B* is constructed with a small hole *X* at the top to allow air and other incondensable gases to escape so that the bucket could drop to open the valve *V*.

Steam, water and air enter through the inlet *A* and are discharged upwards into the inverted bucket. As long as only water enters the trap, the bucket by virtue of its own weight rests at the bottom of the trap body allowing the valve *V* to remain fully open as illustrated. Under these conditions the condensate can pass freely through the trap to the discharge outlet *O*. The condensate is pushed forward and upward by the steam pressure in the pipe leading to the trap.

When air in large volume enters the bucket *B* with the water, and cannot pass freely through the hole *X*, it will collect in the top of the bucket and will replace some of the water. If sufficient air accumulates in the bucket to displace most of the water, it will make the bucket buoyant, causing the bucket to rise and thereby close the valve *V* as shown in Fig 21.

The closing of the valve *V* prevents further discharge from the trap and it remains closed until the air in the top of the bucket can escape through the hole *X*, thereby allowing the bucket to drop again and open the valve. This cycle of operations will continue until all air has been expelled from the apparatus or system to which the trap is attached.

When steam enters the trap with the water, it rises into the bucket and displaces some of the water, causing the bucket to become buoyant in the same manner described for air. However, when the steam enters the bucket it will quickly condense and give up its heat to the surrounding water until all the water in the trap reaches the full temperature of the steam, after which it will hold the bucket in a buoyant condition for longer periods.

Under ordinary conditions of operation, some of the steam which collects in the bucket will condense as heat is lost because of direct contact of the steam with the bucket and water, due to cooling of the trap. Most of this steam escapes through the small hole *X* at the top of the bucket into the space at the top of the trap. The steam which escapes into the top of the trap, if not condensed, will be discharged with the water when the trap opens, so it is important not to have too large a hole in the top of the bucket.

One type of inverted bucket trap has a thermostatic element to liberate automatically air and other non-

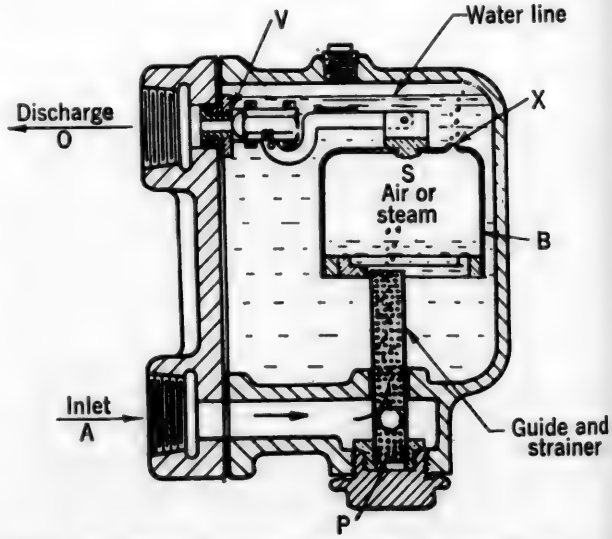


Fig. 21. Inverted bucket trap with bucket in its top position.

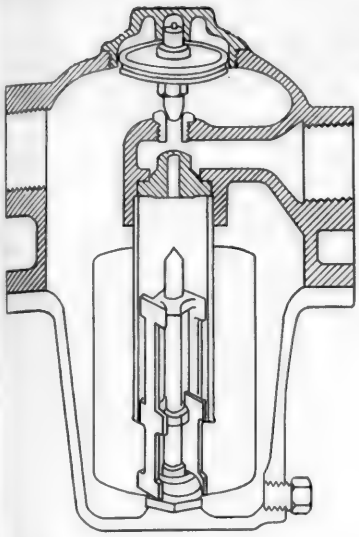


Fig. 22. Upright bucket trap with thermostatic trap.

condensable gases from the top of the bucket. It is not generally understood that the length of time the inverted type of bucket trap remains closed depends not upon how little or much there is of condensate in the heater, but rather upon the time required to leak trapped steam and air through the small vent hole in the top of the bucket. This hole is made small to prevent the passage of too much steam at light loads and is usually large

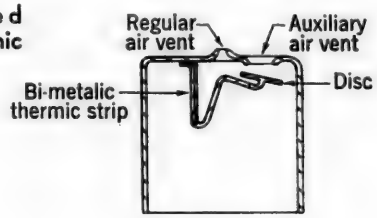


Fig. 23. Inverted bucket with thermic strip.

enough to pass the air in small traps. It may not give adequate initial air relief on large traps to permit the bucket to fall and close the valve. Too much time lag can cause partial water-logging of the heater with consequent annoying low temperature air blast. One disadvantage of inefficient air removal, it is said, is increased corrosion in unit heater tubes.

Bi-metallic Elements for Venting

The upright bucket trap shown in Fig 22 is equipped with a thermostatic trap in the top to bypass air around the water seal. The seal may amount to only a few ounces of pressure when the fires are banked at night with some steam condensing in the mains. Bi-metallic vents are also used, but to make certain they will be closed against steam at varying pressures or tempera-

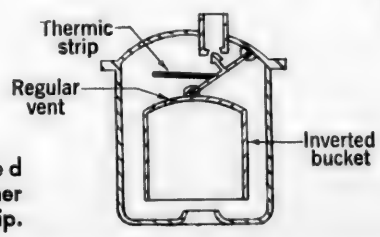
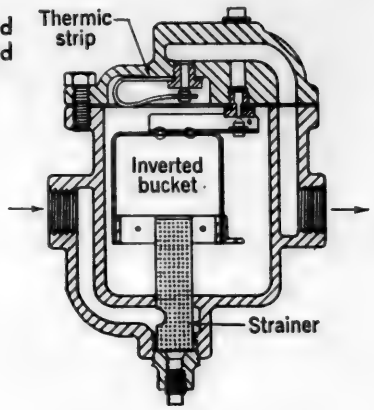


Fig. 24. Inverted bucket with another type of thermic strip.

Fig. 25. Inverted bucket with S-shaped bi-metal strip.



tures, they must close at 212 deg and must remain so at higher temperatures.

In Fig. 23, differing expansion rates in the two metals in the thermic strip at the top of the bucket bend the thermic strip down when cold to the position shown. This opens an auxiliary air vent to speed up venting when starting up. In Fig. 24 the thermic unit holds the condensate discharge valve away from the seat when the trap is cold. In Fig. 25 a bi-metal S-shaped strip bends upward when hot to close the bypass vent in the cover. In Fig. 26 steam reaching the thermal disc or auxiliary vent in the side of the bucket causes the disc to snap to the closed position. In Fig. 27, a thermal strip

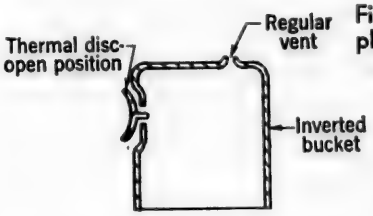


Fig. 26. Thermal disc placed in the side of an inverted bucket.

controls a bypass vent port. In Fig. 28 the thermic strip controls the usual vent port in the bucket, which port in this case can be made larger. The foregoing are differing methods and devices for automatic venting of inverted bucket traps by metal expansion, either by direct venting of the bucket to pass the air into the trap body, or as auxiliary vents to bypass the air from the trap body. By these means, vent ports can be made larger for increased air discharge.

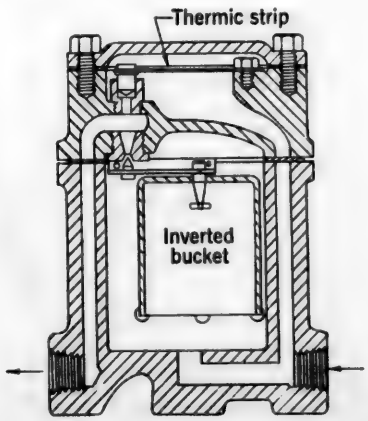


Fig. 27. Thermal strip controls a by-pass vent port.

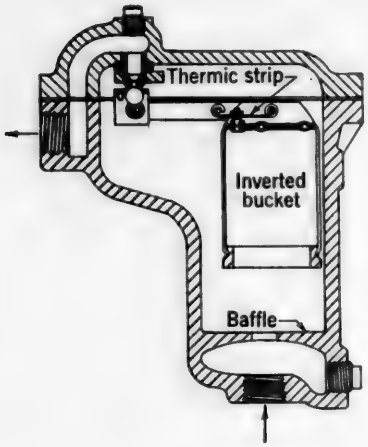
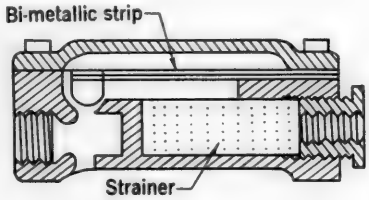


Fig. 28. Thermal strip controls the vent port in an inverted bucket.

The small separate venting element shown in Fig. 29 can be used for installation in an air bypass around both types of bucket traps, as shown in Fig. 30, or it may be used as a trap itself, especially so to drain bucket traps to prevent freezing. Fig. 31 shows a bi-metal strip applied to a float trap. When cold, the thermal element holds the discharge valve open, but when steam reaches the element it expands, thus permitting the float to control the valve.

Fig. 29. Separate venting element.



Float and Bucket Traps with Special Features

There are traps with additional features common to certain makes and types and regularly furnished or offered as optional equipment. This is particularly so with bucket traps such as reversible valve and seat for renewed life, Fig. 32, thermostatic or thermal vents as previously illustrated, and various built-in devices, like check valves, bypasses and strainers. Then there are a few traps with innovations peculiar to the traps of certain manufacturers.

In float and bucket traps, invention has concentrated

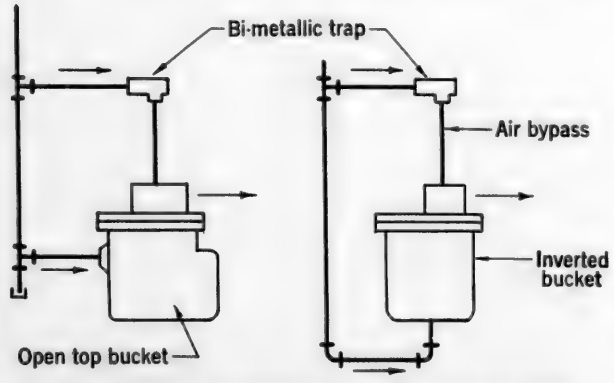
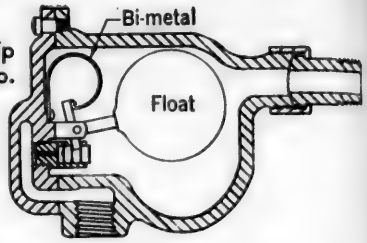


Fig. 30. Venting element installed in an air bypass.

Fig. 31. Bi-metal strip allied to a float trap.



on snap action for better closure of valve, greater capacity by using a larger valve and with more power means to close it, venting air from the trap body without passing steam, and the passing of heavy loads without dribbling on light loads. Much attention has also been directed to means for venting the inverted bucket itself.

Notes on Bucket Traps

Some thoughts about bucket traps were presented in a house organ of a well known trap manufacturer, who like many manufacturers, sells various trap types including the inverted bucket. This article stated:

"There are many applications where a bucket trap, float thermostatic and thermostatic trap could be used without trouble, hence there is much confusion as to which should be used, especially so with the inverted trap. Back of this confusion is the mistaken idea that a

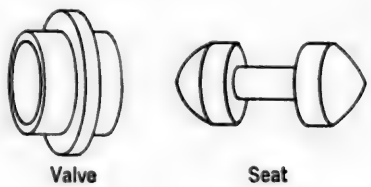


Fig. 32. Reversible valve and seat to give increased life.

trap operating without trouble is operating successfully. Now a steam system will work even though steam is wasted to the return lines, in fact may work after a fashion without any traps.

"The inverted bucket trap being low priced, is apt to be used where a higher priced trap is indicated. Although it may be used with low pressures, even on vacuums, we do not ordinarily recommend it for such use because condensate does not flow through the trap by gravity as with a float or thermostatic trap. Therefore, there must be enough steam pressure at all times to lift from the trap inlet to outlet above. Nor should this trap be used where air venting is a primary problem.

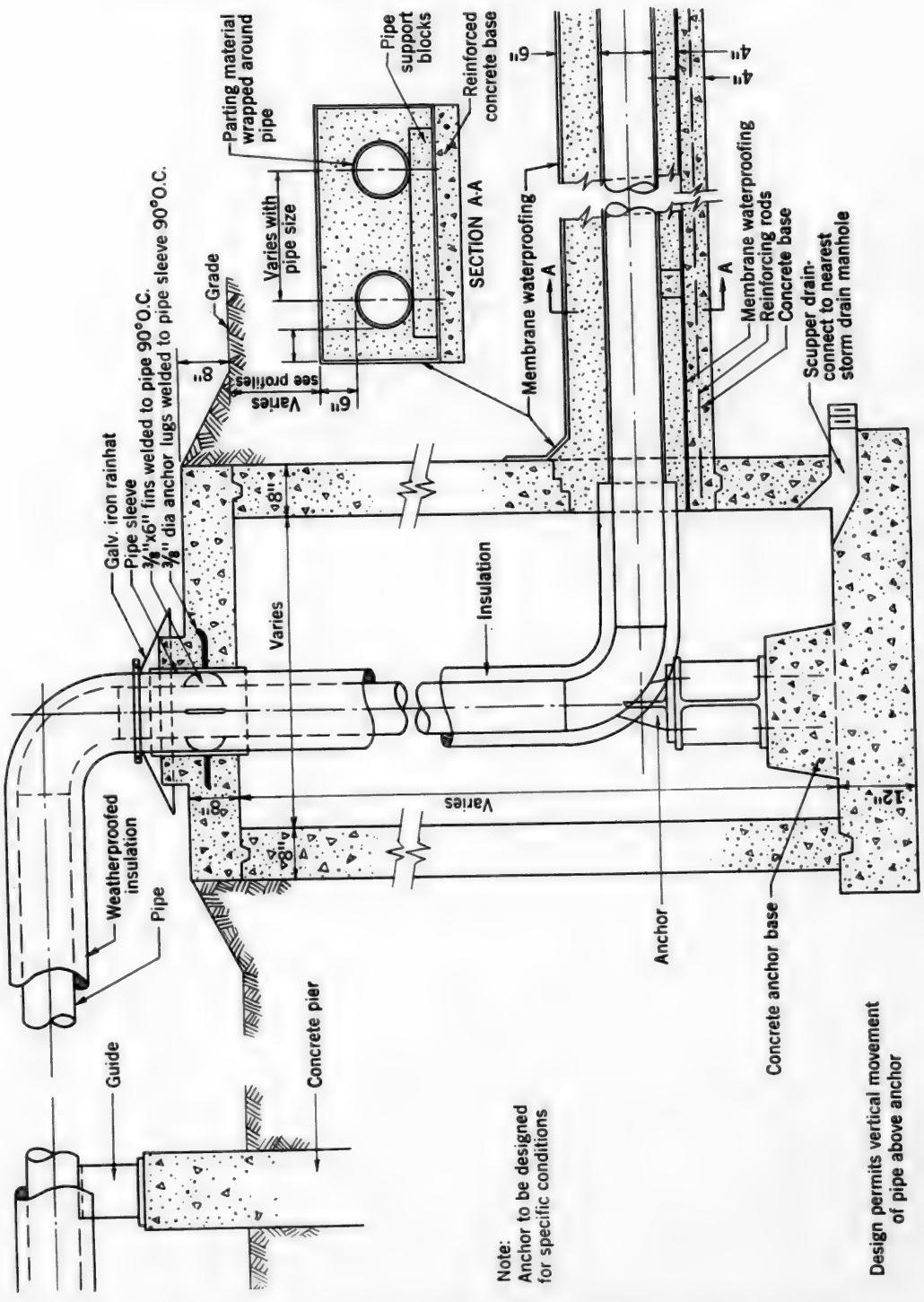
"The bucket trap may work on pressures as low as 5 psi, but a float and thermostatic trap will operate much more efficiently because of its integral thermostatic bellows for eliminating air and because it permits gravity drainage. Being of simple rugged construction, this type of trap is much used in industry.

"Some advantages of the inverted bucket trap are absence of wire drawing (since the trap is either open or closed) and the ability to elevate water to overhead returns. In such cases, a check valve in the horizontal piping immediately after the trap outlet will prevent reverse flow with pressure fluctuations or steam flash from hot condensate at high pressure. Inlet pressure

(Concluded on page 122)

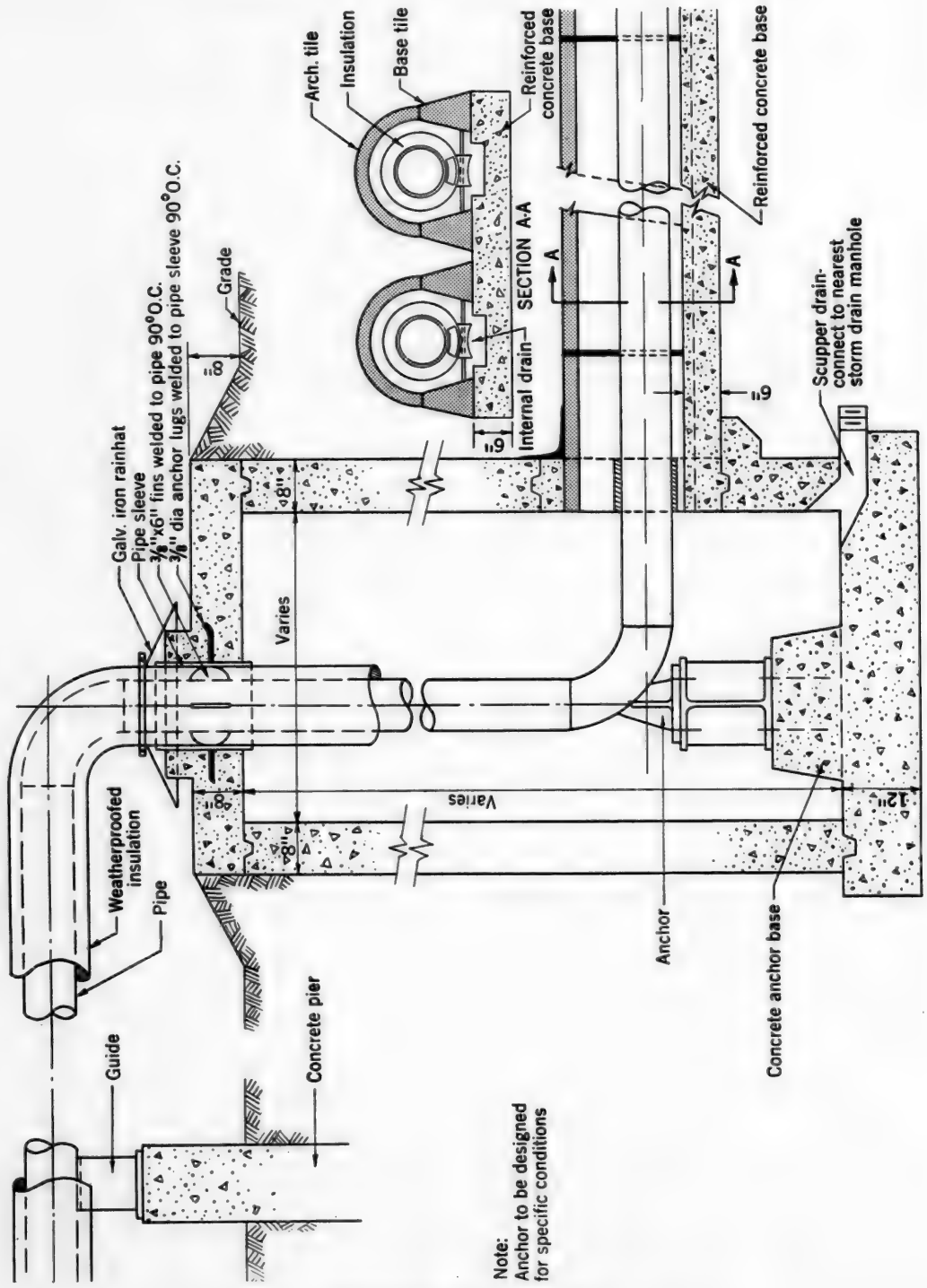
TRANSITION MANHOLE

UNDERGROUND PIPE — MOLDED INSULATING CONCRETE



TRANSITION MANHOLE

UNDERGROUND PIPE — TILE PIPE COVERING



Drawings on This and Reverse Page,
Courtesy of B. H. Krueger and E. N. Morris of Guy B. Panero, New York, N. Y.

Tables save time in

Excess Air Calculations

E. W. JERGER, Associate Professor
Department of Mechanical Engineering, University of Notre Dame
Notre Dame, Indiana

To save time in calculations involving excess air, the following tables show, for various fuels, the effect of excess air variation on (1) percent carbon dioxide in dry products of combustion, and (2) useful forms of air-fuel ratio.

COMMERCIAL fuels can be burned satisfactorily only when the amount of air supplied to them exceeds that which is theoretically calculated as required for perfect combusion from equations showing the chemical reactions involved. The quantity of excess air provided in any particular case is dependent on many variable factors including the state of the fuel itself, design of the furnace, and the fuel-burning equipment used. In general, for perfect combustion, solid fuels require the greatest, and gaseous fuels the least, quantity of excess air. Fuels that are finely subdivided on entering the furnace burn more easily and require less excess air than those introduced in large lumps. In addition, burners, stokers, and furnaces which incorporate in their design features that produce a high degree of turbulence require less excess air.

Excess air, expressed in percent of the theoretical air, is conventionally measured in terms of carbon dioxide content in the products of combustion as determined by an Orsat apparatus. However, to find the excess air-carbon dioxide relationships, long, involved equations involving the molecular weight of the fuel constituents have been required. The following tables provide time-saving references, designed to give at a glance, for various fuels, the effect of excess air variation on the percent carbon dioxide in the products of combustion.

In addition, the tables present, for each relationship of excess air and percent carbon dioxide, useful forms of the air-fuel ratio.

Example

Find the size of fan required to supply air for an oil burner rated at 10 gal per hr, assuming 20% excess air. From the table section covering fuel oil, it is found that the air-fuel ratio at 20% excess air is equal to 1688.84 cu ft dry air per gallon of fuel. Therefore:

$$\text{Fan size required} = \frac{(1688.84 \text{ cu ft per gal})\ (10 \text{ gal per hr})}{60 \text{ min per hr}} = 282 \text{ cfm}$$

An Orsat reading of 12.9% CO_2 will indicate complete combustion at 20% excess air.

EFFECT OF EXCESS AIR VARIATION ON COMBUSTION CHARACTERISTICS OF FUELS

FUEL OIL (GRADE NO. 2 OR NO. 3)

(86.0% C, 12.4% H_2, 0.4% S, 0.6% O_2, 0.6% N_2, HHV : 140,000 Btu per Gal)

Percent of Excess Air	Percent CO_2 in Products	Air Fuel Ratio in Lb Dry Air per Lb Fuel	Air Fuel Ratio in Lb Dry Air per Gal Fuel	Air Fuel Ratio in Cu Ft Dry Air per Lb Fuel[a]	Air Fuel Ratio in Cu Ft Dry Air per Gal Fuel
0	15.7	14.17	105.42	189.17	1407.36
10	14.1	15.59	115.96	203.09	1548.10
20	12.9	17.00	126.50	227.01	1688.84
30	11.9	18.42	137.04	245.93	1829.58
40	11.0	19.84	147.58	264.85	1970.32
50	10.2	21.26	158.12	283.77	2111.06
60	9.6	22.67	168.66	302.69	2251.80
70	9.0	24.09	179.20	321.61	2392.54
80	8.5	25.51	189.75	340.53	2533.28
90	8.0	26.92	200.29	359.45	2674.02
100	7.6	28.34	210.84	378.37	2814.76
120	6.9	31.17	231.91	416.20	3096.33
140	6.3	34.02	252.98	454.03	3377.90
160	5.8	36.85	274.05	491.86	3659.47
180	5.4	39.69	295.12	529.69	3941.04
200	5.0	42.51	316.19	567.52	4222.61

[a] For dry air at 70 deg F, 29.92 inches Hg.

(Table continued on next page)

EFFECT OF EXCESS AIR VARIATION ON COMBUSTION CHARACTERISTICS OF FUELS (CONTINUED)

NATURAL GAS (90% CH_4, 5% C_2H_6, 5% N_2)

Percent of Excess Air	Percent CO_2 in Products	Air Fuel Ratio in Lb Dry Air per Lb Fuel	Air Fuel Ratio in Lb Dry Air per Cu Ft Fuel[a]	Air Fuel Ratio in Cu Ft Dry Air per Cu Ft Fuel[b]
0	11.8	15.7	0.705	9.17
10	10.6	17.3	0.776	10.09
20	9.7	18.9	0.847	11.00
30	8.9	20.5	0.918	11.92
40	8.2	22.0	0.989	12.84
50	7.6	23.6	1.06	13.76
60	7.1	25.2	1.13	14.67
70	6.7	26.8	1.20	15.59
80	6.3	28.3	1.27	16.51
90	5.9	29.9	1.34	17.42
100	5.6	31.5	1.41	18.33
120	5.1	34.6	1.55	20.17
140	4.8	37.7	1.69	22.00
160	4.3	40.9	1.83	23.84
180	3.9	44.0	1.97	25.67
200	3.7	47.2	2.11	27.50

[a] For natural gas saturated at 60 deg F, 30 inches Hg.
[b] For natural gas saturated at 60 deg F, 30 inches Hg and dry air at 60 deg F, 29.92 inches Hg.

PROPANE

Percent of Excess Air	Percent CO_2 in Products	Air Fuel Ratio in Lb Dry Air per Lb Fuel	Air Fuel Ratio in Lb Dry Air per Cu Ft Fuel[b]	Air Fuel Ratio in Cu Ft Dry Air per Lb Fuel[a]	Air Fuel Ratio in Cu Ft Dry Air per Cu Ft Fuel
0	13.8	15.7	1.82	209.2	24.3
10	12.4	17.3	2.01	230.1	26.7
20	11.3	18.8	2.19	251.0	29.1
30	10.4	20.4	2.37	272.0	31.6
40	9.6	22.0	2.55	292.9	34.0
50	8.9	23.5	2.73	313.8	36.4
60	8.3	25.1	2.92	334.7	38.9
70	7.8	26.7	3.10	355.6	41.3
80	7.4	28.2	3.28	376.6	43.7
90	7.0	29.8	3.46	397.5	46.1
100	6.6	31.4	3.64	418.4	48.5
120	6.0	33.5	4.00	460.2	53.4
140	5.4	36.7	4.37	502.1	58.2
160	5.0	39.8	4.74	543.9	63.1
180	4.6	42.9	5.10	585.8	67.9
200	4.3	47.1	5.46	627.6	72.8

[a] For dry air at 70 deg F, 29.92 inches Hg.
[b] For propane at 60 deg F, 30 inches Hg.

BUTANE

Percent of Excess Air	Percent CO_2 in Products	Air Fuel Ratio in Lb Dry Air per Lb Fuel	Air Fuel Ratio in Lb Dry Air per Cu Ft Fuel[b]	Air Fuel Ratio in Cu Ft Dry Air per Lb Fuel[a]	Air Fuel Ratio in Cu Ft Dry Air per Cu Ft Fuel
0	14.0	15.5	2.37	206.4	31.6
10	12.7	17.0	2.61	227.0	34.7
20	11.5	18.6	2.85	247.7	37.9
30	10.6	20.1	3.09	268.3	41.0
40	9.8	21.7	3.33	288.9	44.2
50	9.1	23.2	3.57	309.6	47.4
60	8.5	24.8	3.81	330.2	50.5
70	8.0	26.3	4.05	350.8	53.7
80	7.5	27.9	4.29	371.5	56.8
90	7.1	29.4	4.53	392.2	60.0
100	6.7	31.0	4.74	412.8	63.1
120	6.1	34.0	5.25	454.1	69.4
140	5.6	37.2	5.73	495.4	75.7
160	5.1	40.3	6.21	536.6	82.0
180	4.7	43.4	6.69	577.9	88.4
200	4.4	46.4	7.11	619.2	94.7

[a] For dry air at 70 deg F, 29.92 inches Hg.
[b] For butane at 60 deg F, 30 inches Hg.

EFFECT OF EXCESS AIR VARIATION ON COMBUSTION CHARACTERISTICS OF FUELS (CONTINUED)

BITUMINOUS COAL

(78.0% C, 5.5% H_2, 1.4% N_2, 8.1% Ash, 7.0% O_2, HHV : 14,000 Btu per Lb)

Percent of Excess Air	Percent CO_2 in Products	Air Fuel Ratio in Lb Dry Air per Lb Fuel	Air Fuel Ratio in Cu Ft Dry Air per Lb Fuel[a]
0	18.4	10.6	141.3
10	16.7	11.6	155.4
20	15.3	12.7	169.5
30	14.1	13.8	183.6
40	13.1	14.8	197.7
50	12.2	15.9	211.8
60	11.4	16.9	225.9
70	10.7	18.0	240.0
80	10.1	19.1	254.1
90	9.6	20.1	268.3
100	9.1	21.1	282.6
120	8.2	23.3	310.8
140	7.5	25.4	339.0
160	7.0	27.5	367.2
180	6.5	29.7	395.4
200	6.1	31.7	423.9

[a] For dry air at 70 deg F, 29.92 inches Hg.

Heat Transfer in Underground Chambers

Since World War II, much attention has been given to the use of natural or man-made caves by military, industrial, and civil defense groups for storage of goods or for shelter of personnel. One of the problems encountered is that of maintaining the space at a selected design temperature that may differ from that of the surrounding rock. When such an underground space is to be cooled or warmed to other than its natural temperature, heat transfer between the space and the earth must be considered under the transient conditions which exist. Heretofore, adequate data on the heat flow have not been available. To establish design criteria, scientists at the National Bureau of Standards have undertaken both theoretical and experimental approaches toward providing the needed information. The studies were carried out for the Office of the Chief of Engineers, U. S. Army, by B. A. Peavy of the Bureau's heat transfer laboratory.

The shapes of underground chambers approach those of hollow rectangular parallelepipeds. However, a mathematical solution for transient heat flow outward from a rectangular parallelepiped would yield expressions in three dimensions from which it would be troublesome to obtain numerical values. An infinite cylinder, or a sphere, may also be used to approximate the shape of a chamber, and the mathematical solutions obtained for these shapes are much more readily evaluated. The radius of an equivalent cylinder or sphere can be easily computed from the surface area of the chamber for which it is an approximation. Some departure of results calculated for these simple shapes from those of an actual chamber must be expected as a result of end, edge, and corner effects. Accordingly, experimental results were obtained in an actual cave to provide data for correction factors to make the mathematical solutions applicable to actual chambers with adequate accuracy.

For the experimental work, a chamber, 100 by 35 by 10-ft high, was chosen. It was located a few hundred feet underground and remote from the surface in a horizontal direction. The thermal properties of the dense rock surrounding the chamber were determined at the Bureau. Within the chamber, as shown in illustration, 385 thermocouples were installed at various locations in the air, on the rock surface, and at various distances in the rock to a depth of 12 ft. Heat was added to the air by electric strip heaters mounted in the air ducts. The heat input rate was measured with watthour meters connected to the heaters.

The results of this and two similar experiments showed that the heat input necessary to maintain a constant temperature was slightly greater than that indicated by the mathematical solutions for the cylinder or the sphere. Correction factors based on the dimensions of the chamber were therefore formulated so that the mathematical solutions could be applied in a practical manner to caves of various shapes and dimensions.

National Bureau of Standards experimental underground chamber for heat transfer studies.

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Air Conditioning Comes Naturally To Rocket City, Alabama

Mother Nature is providing a big assist for air conditioning in Huntsville, Alabama, the town that gets its nickname "Rocket City" from nearby Redstone Arsenal where scientists develop some of the most advanced rockets and guided missiles. Nature's helping hand comes in the form of a natural spring, one of the largest on earth, located at the base of a 60-ft high rock wall in the center of the city. The spring has a daily flow of about 24-million gallons, offering an almost unlimited supply of water at a low temperature of 60 to 62 deg F. As a result, substantial savings on initial cost of cooling equipment and on operating expenses are being seen.

As an example, A. L. Clark, Tuscumbia, Ala., engineer, cites air conditionng savings expected for the new $1,250,000 Electric Service Center. According to Clark, who is engineering the Trane air conditioning system, a saving of $25 per ton of refrigeration will be realized on the cost of cooling equipment for the building. In addition, operating cost savings will be at least 10%.

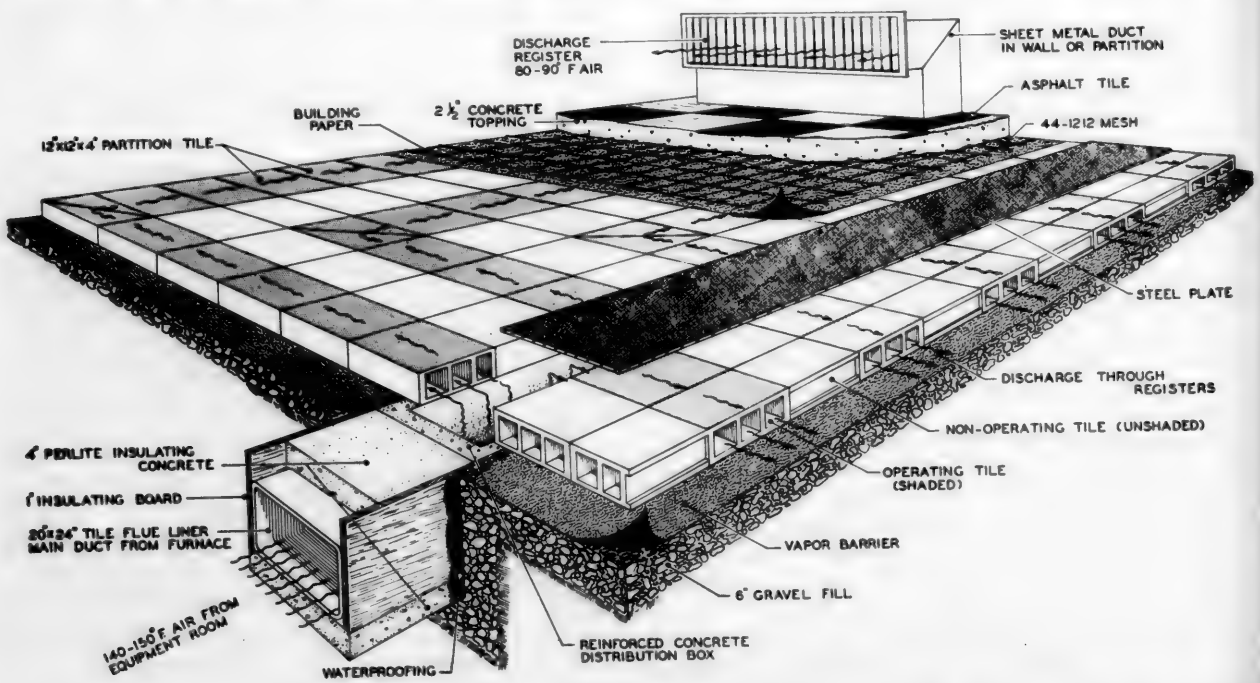
Temple's Construction Demands Met By Variations of Volcanic Material

A single answer to a number of construction problems was supplied recently by perlite aggregate in building the new Fairmount Temple, Beechwood Village, Cleveland, Ohio. Perlite—a white, ultra-lightweight volcanic substance that is replacing ten-times-heavier sand in plaster and concrete—was specified for three special purposes: (1) perlite-gypsum plaster for fireproof walls and ceilings; (2) perlite insulating concrete for a novel heating system; and (3) perlite acoustical plaster for sound control.

The $2.5-million building was designed by Percival Goodman, New York, with Braverman & Halperin of Cleveland as associate architects. It serves an average of 500 worshippers but through multiple usage of space can accommodate a peak attendance of 5,000 persons. Additionally, educational facilities are provided for 900 students.

One of the building's major construction features is its heating and ventilating system which can also be adapted for air conditioning. Warm filtered air is forced from two boiler rooms through underground feeder ducts and is discharged into triple-cored clay tile blocks under the on-grade slab. These 12 x 12 x 4-inch blocks are placed end to end so that their interior distribution ducts line up across the rooms. After the warm air passes through the blocks radiating heat through the floors, it is discharged into the rooms at comfortable temperatures via wall and window sill registers.

To reduce heat transmission loss by 50% or even more, the design specified a four-inch thickness of perlite concrete insulation over and under 3,400 lineal feet of main distribution duct and under some portions of the radiant heating tile blocks. For this project 285 cubic yards of perlite concrete were required. This insulating concrete not only prevents condensation within the buildings but is also resistant to fungus, rot, rodents and water damage.



LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Plumbing Systems for a 20-Story Hotel

PLUMBING in hotels includes a number of systems such as pipe lines for the sanitary system, water supply, service hot water, chilled water for drinking, and the roof tank. In order to bring out the design features for these items, a 20-story hotel will be considered, and the various illustrations are drawn for a multi-story hotel of this size.

Sanitary System

The typical arrangement of fixtures for the hotel room is shown in Fig 1. Fixtures include a water closet, lavatory and bathtub-shower combination. The fixtures are arranged back to back, where practical, so that one stack of plumbing risers will serve two hotel bathrooms. A hotel will therefore require numerous stacks to serve each pair of hotel bathrooms, and the layout for a typical stack is illustrated in Fig. 2 and 3. Features of the connections are shown in Fig. 3.

The typical stack consists of a soil stack, vent stack, cold water line, hot water line and a chilled drinking water line. The stack extends upward from the basement to the top of the building.

The selection of the type of piping material to be used for the soil, vent, cold, hot and drinking water piping must of course be determined by the engineer designing the system. For the soil and vent stack, the type of material and manner of joining this pipe is based on the local code requirements and the engineers' selection of the most suitable materials. For the cold, hot and drinking water lines, the selection is based on the characteristics of the local water supply.

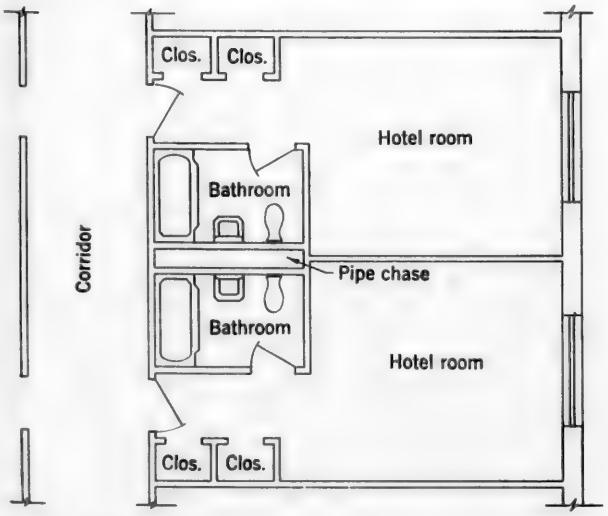


Fig. 1. Typical pair of hotel rooms showing the location of bathrooms and fixtures.

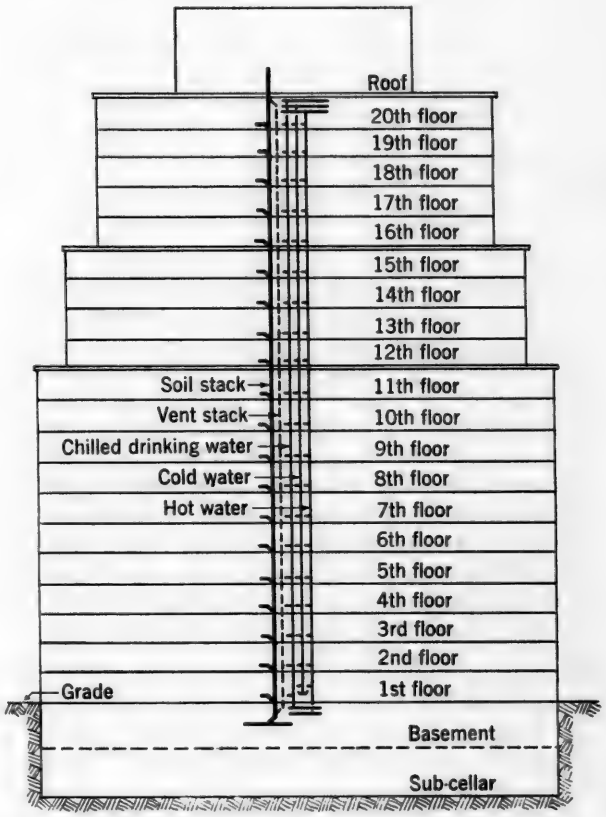


Fig. 2. Arrangement of single plumbing stack for installation in a 20-story hotel.

A well designed soil and vent stack is an important consideration for a hotel. When these two stacks are correctly sized and installed, a proper balance of air is assured for the waste matter discharged by the fixtures. Thus, sluggness in discharge will be avoided, the water seal in the fixture traps of all floors will remain constant, and there will be no gurgling sounds in the water closets at the lower floors when upper floor fixtures are discharged.

Nothing disturbs or makes a guest feel more uncomfortable than a water closet with a trap seal that gurgles and fluctuates everytime the upper story fixtures are discharged. A well designed system will prevent this.

Water Supply

An abundant supply of clean, wholesome water is an

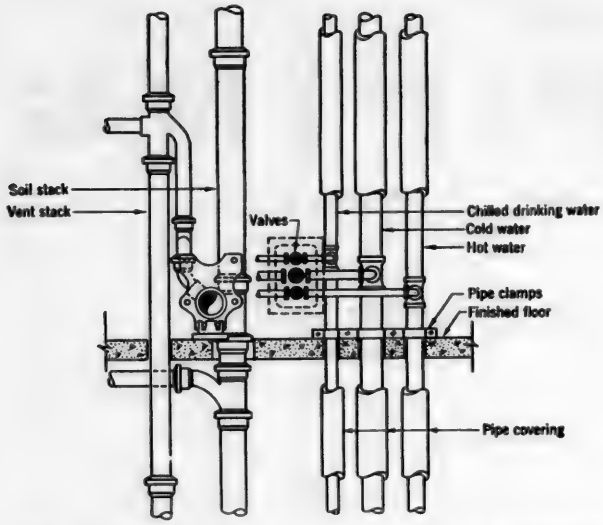


Fig. 3. Plumbing lines for a typical set of bathrooms located back to back.

asset in a hotel. This supply of water should be free of disagreeable odors, tastes and foreign matter. If the local water supply is not free from such impurities, it should be filtered, treated and softened in the building before it is supplied to the numerous fixtures and equipment, as well as to the heating equipment contained in the building. Various types of apparatus for filtering and treating the water is available on the market. Proper treatment of the water in many instances is an investment that will preserve and prolong the life of the piping that conveys the water. The actual characteristics of the local water supply as well as the means that can be utilized to improve it is easily obtained from a manufacturer that specializes in this type of equipment. Some companies even install the equipment on a rental basis.

Water Pressure

Since the hotel used for example in this article is a 20-story building, the water supply must be capable of furnishing water in abundant quantity to all fixtures and equipment in the building. The cold water supply system must, therefore, be designed and sized for the peak demand load of the building.

The demand includes the cold and hot water systems. If the air conditioning system utilizes the building water supply rather than an independent source of water, then careful attention must be given this matter. Quite often, in large buildings, the gallons per minute demand for water due to air conditioning will equal or exceed the service water requirements. It is, therefore, good practice to carefully check this need before proceeding too rapidly with the system design.

The next question is the type of water system that will best distribute the water throughout the building. For a building of this type, even a good street pressure would not be sufficient to service the upper floors of the building. To overcome this deficiency of water pressure, other methods must be employed in the building to bolster the water pressure and maintain it at a constant degree.

This can be accomplished in one of three generally accepted ways as:

1. Booster pumps.
2. Pneumatic tank.
3. Roof tank.

Here again, the selection of the type of system that will best fulfill the needs of the building rests with the engineer. If the street pressure is sufficient to service a given number of stories in the building, he may choose to combine it with one of the systems mentioned. In this manner, the street pressure will be used for the specific number of floors it can adequately serve while the pressurized system will serve the remaining floors above.

The booster pumps would be of value in buildings of lesser size; not practical in a 20-story building.

A pneumatic tank can be used with a good deal of success. However, for best results, it would be advisable to employ the use of two pneumatic tanks. One would be located in the sub-cellar or basement and the other at the 10th floor level. The lower tank will supply the first 10 floors while the tank at the 10th floor will supply the upper stories. In this article we have chosen to feature a roof tank system.

Cold Water System

With a roof tank system, the water supply is pumped up into the roof tank by means of house pumps. Electrical control devices activate the house pumps when the water level in the tank drops below a predetermined level. The roof tank is elevated above the roof to a specific height to provide the water pressure needed for the proper operation of the plumbing fixtures at the top story in the building.

With a roof tank as a means of providing the necessary water pressure, the cold water system could be similar to that shown in Fig 4.

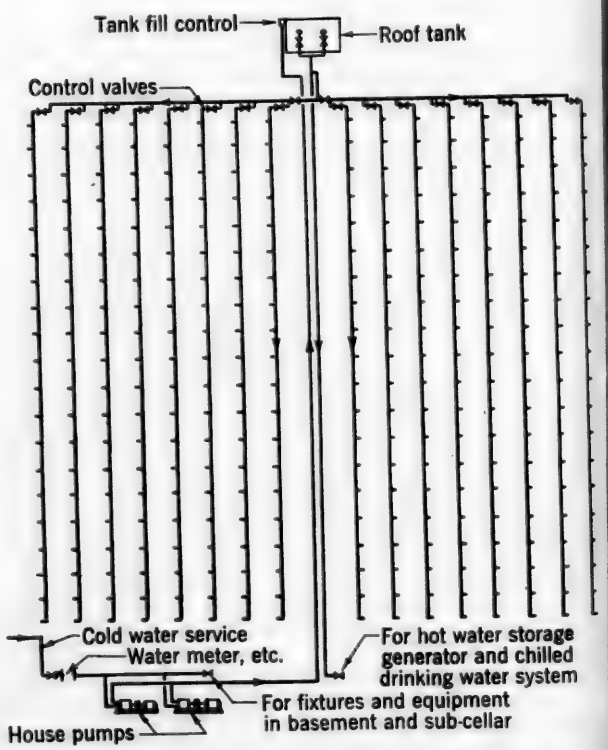

Tank fill control
Roof tank
Control valves
Cold water service
Water meter, etc.
For hot water storage generator and chilled drinking water system
For fixtures and equipment in basement and sub-cellar
House pumps

Fig. 4. Elevation of a typical arrangement of a cold water distribution system.

Referring to this figure, you will note that the cold water system is a downfeed supply. The water distribution mains are located at the top floor of the building. The water risers drop in each pipe chase to supply the fixtures at each floor.

The water pressure for the lower floors will increase considerably due to the height of the piping system. In this case, pressure reducing valves must be placed on the horizontal branch water lines serving fixtures on such floors.

The water lines should be securely anchored to support the weight of the piping and also prevent piping vibration. Anti-sweat covering can be utilized to prevent the sweating of the cold water piping in addition to minimizing the sounds associated with the water passing through the piping.

Roof Tank

The roof tank can be constructed of either wood or steel. It may be erected in an exposed position to the elements or may be concealed in a heated structure set atop the building. When the tank is located in an exposed position in cold climates, a heating coil must be placed in the tank to prevent the water from freezing.

Often the tank is used for both the domestic water as well as the fire reserve water. In this event, the lower portion of the tank is used for the fire reserve while the upper portion is used for the domestic supply. The quantity of fire reserve water to be retained is determined by the local fire department or fire insurance underwriters. The amount of domestic reserve to be contained is determined by the peak demand load in the building and the desired reserve. It is based on the length of time the roof tank will supply the building needs in the event that the exterior water supply fails or is shut-off.

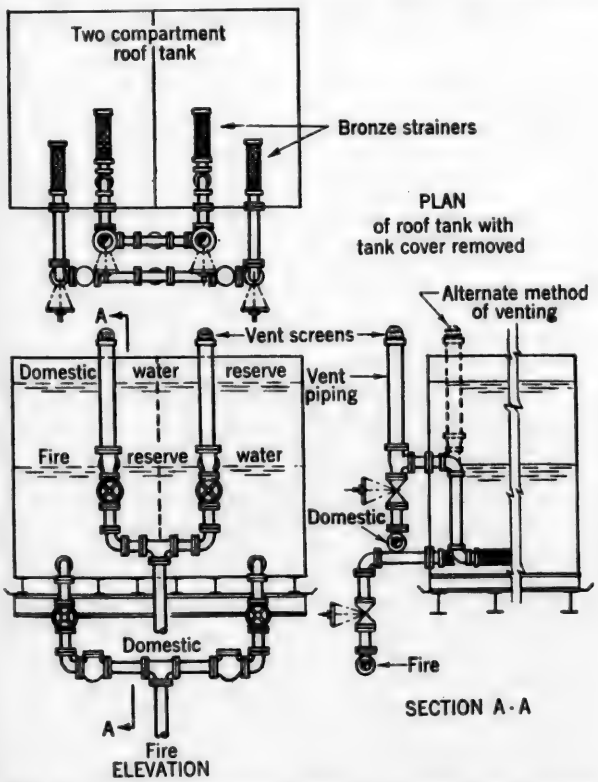


Fig. 5. Details of roof tank piping for a two-compartment roof tank.

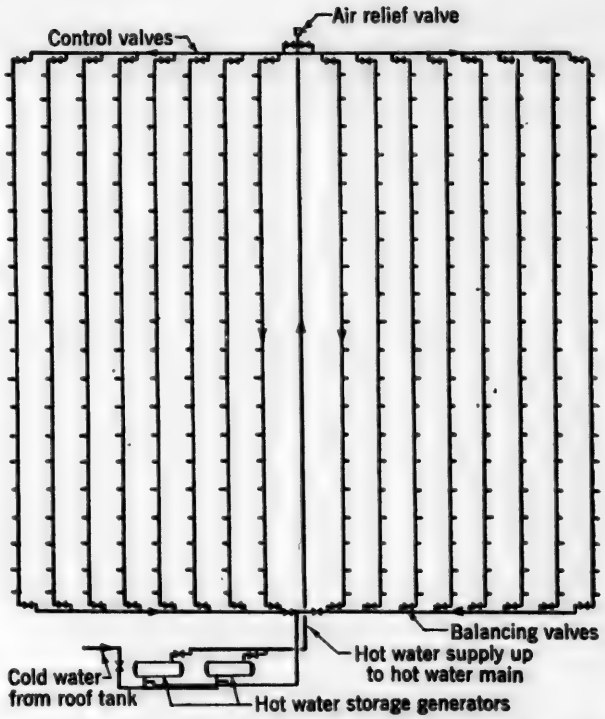

Air relief valve
Control valves
Balancing valves
Hot water supply up to hot water main
Cold water from roof tank
Hot water storage generators

Fig. 6. Elevation of an arrangement of piping for a hot water distribution system.

A 20- or 30-minute reserve is the average since most drops in water are returned to normal in much less time. If the drop in pressure is of a serious nature, like a break in the street main, the reserve will offer enough time for the hotel management to restrict the flow of water until the break has been repaired.

When a roof tank is used for both domestic and fire reserve water, there is every possibility that the domestic reserve water will pick up a disagreeable taste and odor from the fire reserve water. Since the fire reserve water remains motionless at the bottom of the tank it becomes stagnant.

During those times when the tank is filled, a certain amount of turbulence takes place in the tank which mixes the fire reserve water with the domestic water. As a result the fire reserve water imparts its disagreeable taste and odor to the domestic water. Figure 5 shows one method that can be used to safeguard the purity of the water.

A 2-compartment steel tank is shown in Fig 5. Note the special venting connection that permits the domestic water to be drawn from the bottom of the tank without endangering the level of the fire reserve level.

A 2-compartment tank permits one section to be cleaned or repaired while the other section supplies the domestic water and maintains the fire reserve level.

Service Hot Water

Service hot water can be furnished in a number of different ways to serve the needs of the building. For example, in this article we will cover the method detailed in Fig 6.

This method is known as a downfeed system, for the hot water is generated in the basement of the building,

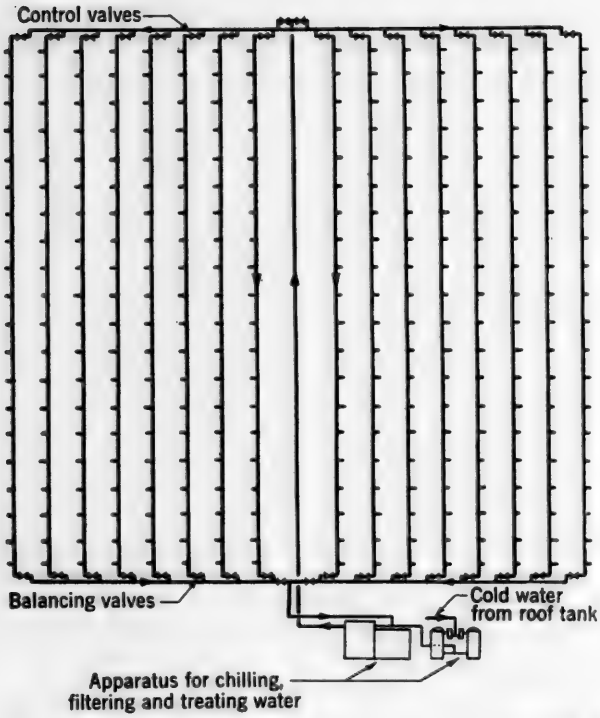


Fig. 7. An arrangement of piping and valves for a chilled drinking water distribution system.

piped to the top floor of the building where it is distributed to feed the downfeed risers. At the base of the risers, the water lines are connected to a hot water return main which assures the circulation needed to serve all portions of the building.

It is quite important that balancing valves be installed at the base of the risers to ensure that the hot water will be evenly distributed throughout the entire system of piping.

The means for generating hot water is not discussed. A recommendation is made that this means of hot water generation be of some duplex type. For example, if a steam hot water storage generator is contemplated, two storage generators should be used instead of one. For hotels, this is a necessary consideration since the supply of hot water should never be interrupted. If one generation unit fails or is being serviced, the other will carry the load.

Chilled Drinking Water System

The chilling of drinking water is a must in every hotel because it makes the water more palatable and refreshing. This system must be carefully designed to serve all rooms in the hotel in an adequate manner. A typical system is shown in Fig 7.

The chilling apparatus may be installed either in a lower floor of the building or the top floor. In this instance, we have selected a lower floor.

The supply of chilled water is conveyed to the top floor of the building where it is distributed to feed the downfeed risers. Balancing valves are placed at the base of the risers to ensure an equal distribution of water throughout the entire system.

Chilled water equipment usually includes the necessary apparatus to filter and treat the water to furnish it in the highest degree of purity and taste.

Diagrams shown are basic and do not illustrate all the equipment and controls required for each system. They are intended merely to show the general arrangement of the piping in the typical plumbing systems that are installed in the average hotel.

Method Improved for Detecting Tornadoes

During the past few years there has been an ever increasing search for new or improved methods of forecasting severe local storms in the United States. Forecasting techniques have now been developed to the point that a positive forecast of tornadoes can be expected to verify in some portion of the forecast area about 50 percent of the time on a time range of six to twelve hours in advance, according to the American Meterological Society.

A tornado forecast can rarely be pin-pointed, and usually covers an area of 30,000 square miles or more, while the area of destruction from a single tornado rarely exceeds ten square miles.

Once the severe local storm forecast has been issued, the problem of issuing specific warnings for the general public becomes one of determining which particular thunderstorm cell within a given area will be the one that produces a tornado or a destructive windstorm. Of help to the meterologist is the actual report of a visual sighting of the tornado or other severe weather conditions. Based upon one or a series of reports, the path of movement of the tornado may be determined and the task of alerting communities in its path may be conducted more intelligently. Another valuable tool is weather radar. If an actual sighting of a tornado can be associated with a radar echo, the tornado can be tracked by radar continuously and thus facilitate the alerting of the communities in its path.

A recent development in the detecting of severe weather has been in the utilization of sferics detection equipment. It is known that each thunderstorm produces an electrical discharge. The sferics equipment now in use apparently measures the frequency of occurrence of this electrical discharge which has been found to furnish a rough correlation with the intensity of the storm. Such equipment measures only the direction of the storm from the detecting station and the approximate location of the storm may be determined by a triangulation technique utilizing three or more stations. To insure accuracy in the location of sferics-generating thunderstorms, radar is frequently used to supplement such data. Recent new develpoments in sferics equipment and techniques have indicated that the maximum of sferics activity may occur prior to the occurrence of tornado activity.

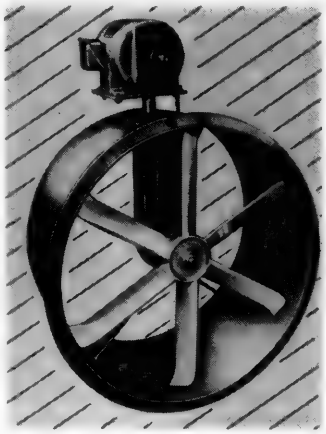
Current investigations indicate that the time between maximum sferics and tornado activity may depend on the type of receiving equipment. The observation of high sferics activity, therefore, should be of assistance in the preparation of short-range warnings of developing storms.

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on the last page for securing further information on new equipment and materials described in this department.

Exhaust Fans Are Code Rated

A series of belt-driven exhaust fans available in 18-, 24-, 34- and 42-inch diameters is announced by Binks Mfg. Co., Chicago, Ill.



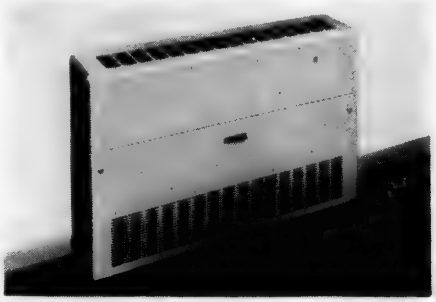
The fans are designed to provide maximum exhaust per horsepower used. They furnish static pressure from ¼- to 1¼-inch. Air volume moved ranges up to 28,375 cfm. This performance is based on average motor speed of 1725 rpm.

Aluminum blades are driven by V-type belts passing through dust-tight housings. The fans meet fire underwriters specifications. Performance rating is in accordance with the standard test code for centrifugal and axial fans.

More information? Circle Item 1, postcard, last page.

High-Capacity Cabinet Heater

Production of Series A, said to be a completely new cabinet heater, is announced by John J. Nesbitt, Inc., Philadelphia, Pa. It is of the high-capacity, blower-fan type for offices, lobbies, showrooms, hotels, hospitals, and other installations where good appearance and quiet operation are required.



There are two unit types available; direct drive or belt drive, both with a selection of 1- or 2-row elements suited for both steam or hot water systems, and a 3-row element for hot water systems. Capacity range of 17,300 to 130,500 Btu per hr steam and 9,100 to 120,000 Btu per hr hot water is offered.

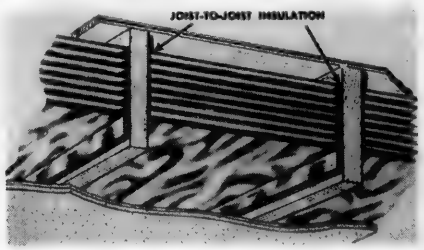
The seven basic sizes of the unit are adaptable to a variety of installation arrangements. Units can be mounted on floor, wall, ceiling, or can be inverted. They can be either free-standing, fully recessed, semi-recessed (to a depth of 2¼ or 6 inches) or concealed behind the wall. Fronts and casings are styled in die-formed furniture steel and bake finished in metallic green enamel. Hinged front panels permit easy access to internal parts.

More information? Circle Item 2, postcard, last page.

Multiple Aluminum Insulation

Seven and three-quarters inches of non-metallic insulation value against up-heat flow in winter through ceilings and roofs, and 11 inches insulation value against down-heat flow in summer have been achieved with a new, multiple aluminum insulation measuring only 5 inches deep, manufactured by Infra Insulation Inc., New York, N. Y.

Called Infra Insulation Type 9, it provides nine parallel, rectangular-shaped reflective spaces, with a *C* factor of .043 and a *U* of .04 for up-heat flow in winter. For down-heat flow in summer, it has a *C* of .029 and a *U* of .03.



The insulation is made of eight 2- and 3-ply aluminum-fiber layers, and can take considerable abuse. Air spaces and layers, ¾ inches apart, stretch from joist to joist with full, uniform depth protection.

Since each layer is metallic and continuous (a few hundred feet long), this insulation is a vapor barrier of almost zero permeability. Because of its construction, condensation formation on or within it is minimized. A sample of the insulation plus additional information are available from the company.

More information? Circle Item 3, postcard, last page.

Improved Pipe, Valve Lining

The Dow Chemical Co., Midland, Mich., announces that it has developed a new Saran lining for pipe, valves, pumps and fittings used by industry in handling corrosive liquids and gases.

In addition to having Saran's immunity to chemical and abrasive attack, the lining has a 50% reduction in its coefficient of thermal expansion. It therefore expands and contracts to approximately the same degree as its steel casing. This makes possible its use in a wider range of temperatures.

Operations from well below zero up to 200 deg F can be handled by the lining without damage. The lining also shows improved impact resistance.

More information? Circle Item 4, postcard, last page.

1957 Annual Index

The annual index to the 1957 issues of AIR CONDITIONING, HEATING AND VENTILATING has been completed. Subscribers may obtain copies by requesting the 1957 Index on a postcard addressed to the Subscription Department, Air Conditioning, Heating and Ventilating, 93 Worth St., New York 13, N. Y.

Protective Draft Cap

A draft cap said to provide full protection against pilot failure, prevent backdraft, and afford rain protection while saving heat loss due to winds, is offered by Tesco Incorporated, Tulsa, Okla.

Manufactured in sizes from 3 through 7 inches, the

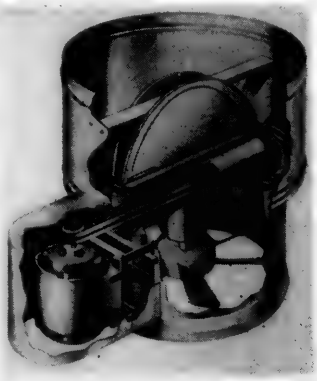
cap operates on a pressure balancing principle that creates the correct draft condition at all times. Of all-aluminum construction, it fits any vent pipe of the same nominal size and performance guarantee with only a 16-inch roof clearance, thus making it unnecessary to extend vents above roof peak in case of a sloping roof.

In addition to furnace vent pipe applications, fluebonnet is used with hot water heaters and industrial plant heating equipment.

More information? Circle Item 5, postcard, last page.

Power Roof Ventilator

L. J. Wing Mfg. Co., Linden, N. J., announces a new roof ventilator known as the Wingjet. The unit has a powerful airfoil-type fan mounted in a weatherproof fan casing. Covering this are non-chattering, aluminum dampers which are opened immediately by the airstream and held open as long as the fan is operating.



An upper casing or windshield surrounds and protects the dampers and is open at the top, without hood or raincap, for free, direct, maximum exhaust. The jet of air is carried at high velocity far above the roof, preventing vitiated air from damaging roof surfaces or re-entering the building through fresh air intakes or windows.

Two types of roof ventilators are available: Type B, for exhausting hot, corrosive or fume-laden air, has motor located out of the airstream in a weatherproof housing, driving the fan by means of a V-belt. In Type C, for exhausting uncontaminated air, the motor, direct-connected to the fan wheel, is located in the airstream.

More information? Circle Item 6, postcard, last page.

Snap-on Insulation

A snap-on type insulation, which simplifies the job of insulating industrial pipe, is offered by Delaware Insulation Co., Wilmington, Del. It is made of urethane foam, a Du Pont development.

Insulation weighs only 3 to 3.25 lb per cu ft, has a

service range from —200 to +250 deg F, thermal conductivity of 0.29 at 75 deg, and tensile strength of 30 lb per sq in. It will not support combustion and can be stretched as much as 190%.

Mostly recommended for low-pressure steam and hot water service, urethane foam comes in standard lengths, but can be cut in random lengths with a knife. It is available with a factory-applied moisture barrier jacket, or can be supplied plain.

More information? Circle Item 7, postcard, last page.

Room Units 63% Smaller

Increased cooling power in a more compact package characterizes its 1958 decorator-styled room air conditioners, announces York Corp., York, Pa., subsidiary of Borg-Warner Corporation. Redesign of compressors, cooling coils, and tubes made possible an increase of 30% in cooling capacity while decreasing the size of the unit 63%.

There are 9 models ranging in size from 1 to 2 hp.

More information? Circle Item 8, postcard, last page.

Longer Electric Baseboards

Two new lengths of electric baseboard heaters, 4 and 6 ft, have been added to the 2-ft length previously available from Westinghouse Electric Corp., Pittsburgh, Pa.

Units are installed along the wall in place of baseboards. Maximum temperature of the vertical outer

surface is just above normal body temperature. A control panel is coupled into the heating system of each room, allowing room-by-room use and conservation of heat. Power requirement is 240 volts a-c.

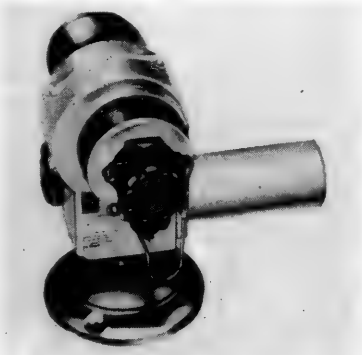
Surfaces are of neutral-beige enamel that require no additional finish, but they can be painted any desired color. Units are rated at 250 watts per ft, and are 7 inches high and two and five-eighth inches wide.

More information? Circle Item 9, postcard, last page.

Conversion Oil Burner

Ease of installation and improved air intake control are principal features of Series 751 conversion oil burners, made by Thatcher Furnace Co., Garwood, N. J.

Air intake on the oil burner is controlled by two separate air bands that are adjusted individually. This



method of adjusting air intake allows a more critical blend of air and oil, giving a fine mixture. The air bands can be set for the exact amount of air required for efficient combustion at all capacities within the range of the burner.

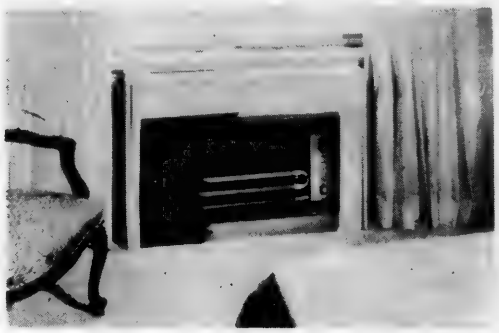
Installation is facilitated by an adjustable pedestal base that compensates for height and angle variations in aligning the burner with the combustion chamber.

A mounting flange designed for application on a variety of heating plants is used to hold the burner in its proper location. Engineering improvements cited by the company include a newly designed air choke which gives better combustion, higher CO_2, and a more quiet flame.

More information? Circle Item 10, postcard, last page.

Apartment Heating-Cooling

A system of heating and air conditioning apartments, developed by Lewyt Air Conditionng Corp., Long Island City, N. Y., combines individual room air conditioners for summer cooling with a central hot-water heating circuit.



Substantial savings are said to have been effected in a 13-story apartment house, the Cherry Hill Apartments, Camden, N. J., with this combination system, as illustrated above.

Units are 14⅝ inches high, 15 inches deep, and 32-7/16 inches wide. They do not project into the room or overhang outside. Cooling unit is rated at one ton; heating system is designed for outside temperature of minus 10 deg F.

More information? Circle Item 11, postcard, last page.

Nozzle for Roof Spraying

A nozzle designed especially for roof cooling applications is announced by the manufacturer, Bete Fog Nozzle, Inc., Greenfield, Mass.

The manufacturer claims that this nozzle, called the RC-1, will give much wider coverage than other nozzles made for this type of service, resulting in less expensive installation costs due to less nozzles and piping required for effective cooling. A coverage of 16-ft dia or approximately 300 sq ft per gal per min is claimed at an operating pressure of 10 psi.

The nozzle employs a spiral principle for producing the spray. This design is least apt to clog due to the absence of internal parts and small orifices. Nozzle is made from a single piece of brass material.

More information? Circle Item 12, postcard, last page.

Portable Drafting Machine

A portable drafting machine that can be folded jackknife-style to fit in the pocket when detached from its drawing board, is introduced for use in office, home, classroom, workshop and in the field by David Miller & Associates, Beverly Hills, Calif.

Called Draftette, the instrument is available attached to a portable drawing board that fits easily into a briefcase. Unit takes the place of T-square, ruler, protractor, and triangles. Of all aluminum construction, it is anodized jet black with gleaming white-filled numbers and letters of the scale and 180-deg protractor. Complete set with 10 x 13 drawing board sells for six dollars; with 11 x 17 board, six and one-half dollars (weight—2 lb); with 20 x 26 board, nineteen dollars (weight—3½ lbs).

More information? Circle Item 13, postcard, last page.

Filter Highlights Conditioners

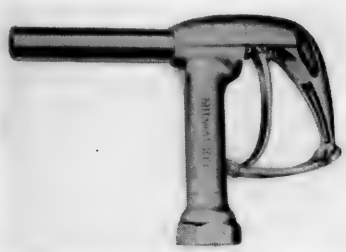
An electrostatic filter, known as Lectrofilter, highlights the 1958 Coolerator air conditioner line produced by Lonergan Coolerator Div., McGraw-Edison Co., Albion, Mich.

The filter is washable, has its own generator powered by airstream, does not produce ozone, and is included on every Custom room air conditioner and optional on all central conditioners, including 2-, 3-, and 4-hp self-contained models, 3-, 4-, and 5-hp remote-type models, and 3-hp heat pumps in self-contained and remote-type models.

More information? Circle Item 14, postcard, last page.

Fuel Oil Nozzle

Milwaukee Valve Co., a subsidiary of Controls Company of America, Milwaukee, Wis., announced the development of a new fuel oil nozzle, Model P-2055.



Ruggedly constructed to withstand hard wearing service, the device is designed to provide full flow performance. Made of lightweight but high strength aluminum, the fuel oil nozzle offers long-lasting dependable control and delivery.

Nozzle is available in two sizes: 1½ x 1½ inches, and 1¼ x 1½ inches.

More information? Circle Item 15, postcard, last page.

Centrifugal Roof Ventilators

A complete line of centrifugal roof ventilators for exhausting air from new or existing buildings is announced by The Trane Company, La Crosse, Wis. Ten direct-drive and 11 belt-drive sizes are available. Models are

identified by fan size, capacity ratings, and type of construction. There are two designs with low-silhouette spun aluminum housings, and a large size design incorporating rugged, long-lasting furniture steel construction.

The inlet orifice of the roof ventilator units is true spun as an integral part of the one-piece aluminum base section (steel on larger units), permitting the entrance of maximum air volumes quietly with a minimum of turbulence and at lower horsepower requirements.

To further assure quiet operation of roof ventilators, moving parts are mounted on a spring steel cage with rubber isolators at eight strategic points. Motor hum and noises are isolated before they can be transmitted to the building below.

More information? Circle Item 16, postcard, last page.

High-Pressure Marine System

A high-pressure marine air conditioning and ventilation system said to be already in successful operation on 150 ships built abroad is available for installation in the United States and Canada, Hi-Press Air Conditioning of America, Inc., New York, N. Y., announces.

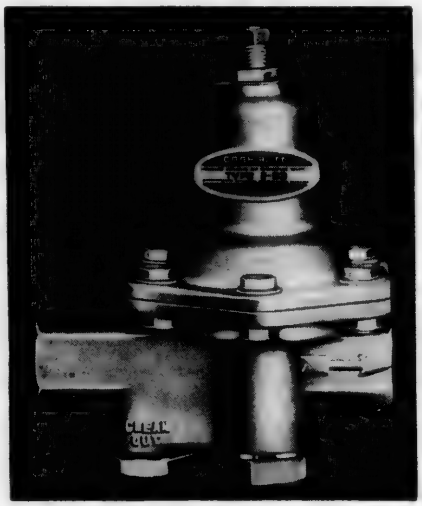
Small pipes, 1¾ to 4¼ inches OD, are used to transmit treated air at velocities of more than 6,000 fpm, yet the system is more quiet than conventional low-pressure systems, the company states. In addition to space, installation, and drafting economies, greater safety results in that fire cannot spread through such small conduits.

System is manufactured under royalty-free licensing agreement with Nordisk Ventilator Co., Denmark. National-U.S. Radiator Corporation will manufacture the central station air conditioning and room induction units. Airtemp Construction Div., Chrysler Corporation, will provide compressors and other components.

More information? Circle Item 17, postcard, last page.

Pressure Reducing Valves

A series of water pressure reducing valves, designated Cash-Acme Type E-93, are said by their manufacturer, A. W. Cash Valve Mfg. Corp., Decatur, Ill., to be completely new and to provide an accuracy in degree of regulation not generally found in its price class.



Suitable for service either on cold water or hot water to 200 deg F, valves are available in ½ to 2-inch pipe sizes. Of all-bronze construction, they are recommended for commercial dishwashers and laundry equipment, schools, apartment buildings, and similar installations requiring high flow rates.

Four-page Bulletin 1-15 contains complete data.

More information? Circle Item 18, postcard, last page.

Electronic Thermometer

An electronic resistance thermometer, designed to indicate on its meter, at one central location, temperatures of remotely located check points throughout a building's heating and air conditioning system, is announced by Barber-Colman Co., Rockford, Ill. This is accomplished through the use of wire resistance elements

that are remotely located and connected to a corresponding switch on a central panel.

Thermometer consists of an indicating meter, a bridge and power supply, and as many sensing elements and selector switches as are necessary to remotely check temperatures at all control points required for each application. The four types of sensing elements available are room, duct, immersion, and outdoor.

Unit is easily adapted to either cabinet or panel mounting, depending on the type of application. More information and engineering data concerning the thermometer is available in data sheet F 8081.

More information? Circle Item 19, postcard, last page.

Units for School Offices

A remote heating and cooling unit for school offices and other non-classroom use is introduced by American Air Filter Co., Inc., Louisville, Ky. The Nelsonaire is a counterpart of the Herman Nelson classroom model.

Units can be placed in offices and other low-occupancy space. For heating, hot water piped from the boiler

room is circulated through the coil. For air conditioning, chilled water is circulated through the same piping and coil. In both cases, fans draw in fresh outdoor air for ventilation. Outdoor air and room air are filtered, mixed, tempered and quietly introduced into the room.

Air conditioning is an optional feature. If current school budgets make no allowance for air conditioning, it can be added later, simply by installing a chiller in the boiler room. In the meantime, offices can benefit from the heating, ventilating, and ventilation cooling features.

Available in 4 sizes, all models are 9 inches deep and 25 inches high.

More information? Circle Item 20, postcard, last page.

Redesigned Baseboard Line

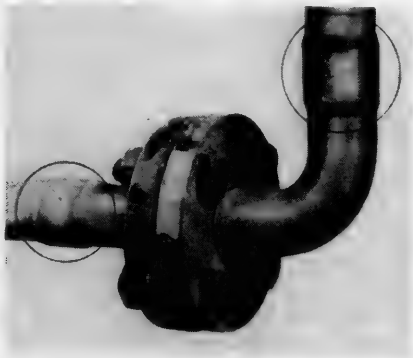
National-U.S. Radiator Corp., Johnstown, Pa., has redesigned its economy line of baseboard radiation, now called Art-Comfortline, in the following particulars:

Its height is lower, making possible picture windows nearer the floor; a more streamlined appearance has been achieved by repositioning the air circulation openings and by rounding off corners; it is so designed that it may be installed after plastering of walls and laying of wall-to-wall carpeting; front panels, corner pieces, splicers, and access doors snap into place without use of screws or tools; and the same model serves recessed or flush installations.

More information? Circle Item 21, postcard, last page.

Stainless Pipe Aligning Connector

Stainless steel piping can be welded quickly by using a new aligning connector, recently announced by Speedline Division of Horace T. Potts Co., Philadelphia, Pa. The connector, encircled in photo, fits over ends of connecting sections permitting in-place pre-assembly of pipe and fittings, and helps to align the system. Another advantage is elimination of icicles inside connections. Such icicles impede fluid flow and cause turbulence in the line.

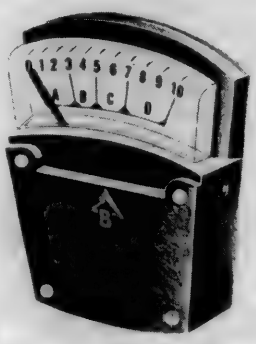


Aligning connectors are specially designed for use with lightwall stainless steel pipe, Schedules 5 and 10 and Speedline fittings. They also connect with conventional Schedule 40 systems. Since lightwall piping systems eliminate threading at joints, excess pipe wall is not needed to provide the thickness required for screwed joints.

More information? Circle Item 22, postcard, last page.

Air Flow Tester

Bacharach Industrial Instrument Co., Pittsburgh, Pa., has developed an air flow tester which is claimed to be the first instrument offered to industry for air flow measurement at less than eleven dollars. This instrument, the Floret air circulation tester, is of compact size and is held in the hand while checking the operation of heating and ventilating installations or any other kind of mechanical air circulation system.



Included in the instrument's specific applications are checking cold air discharge from cooling sections of reach-in refrigerators, display cases, and other cooling units; tracing air movement in refrigerated or heated spaces; spotting drafts in occupied rooms; detecting drafts or leaks around doors and windows; and checking air flow at registers, grilles, diffusers, and convectors.

The device operates on the deflecting vane principle. Pressure exerted by a stream of air flowing through the instrument's case causes movement of the vane which is transmitted to a pointer whose full scale deflection represents air velocity of approximately 1000 fpm. The scale is calibrated in equal divisions numbered from 1 through 10.

More information? Circle Item 23, postcard, last page.

Water Pressure Regulator

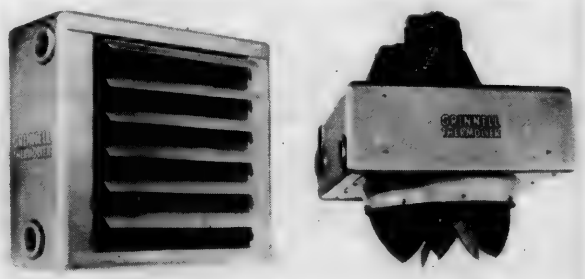
A water pressure regulator designed for multiple dwelling unit installation is announced by Wilkins Regulator Co., Los Angeles, Calif. The 1¼-inch regulator with union end for home and industry use boasts the same features of the company's complete line including all-brass construction, slip-on yoke for quick seat and disc replacement, and seat washer and nylon-threaded Neoprene diaphram for reliable service.

Company states that the entire line, ranging from ¾ to the new 1¼-inch size, is subjected to controlled precision testing to obtain the ultimate in quality production. Each unit bears the company's seal certifying it has been tested, approved, and guaranteed.

More information? Circle Item 24, postcard, last page.

Horizontal, Vertical Unit Heaters

An enlarged range of capacities and a wider choice of models to meet individual heating requirements are offered in the expanded line of 26 models of horizontal and vertical delivery, propeller fan type Thermolier unit heaters, manufactured by Grinnell Company, Inc., Providence, R. I. Single coil heaters, providing moderate temperature rise on high steam pressure and new information enabling the purchaser to match the heater's sound level to the requirements of the occupancy, are available.



Equal heating capacity with less weight has been achieved in the new designs through the elimination of a heavy header and the substitution of brazed tube joints for roller expanded joints. Supply and return connections are made to malleable iron fittings.

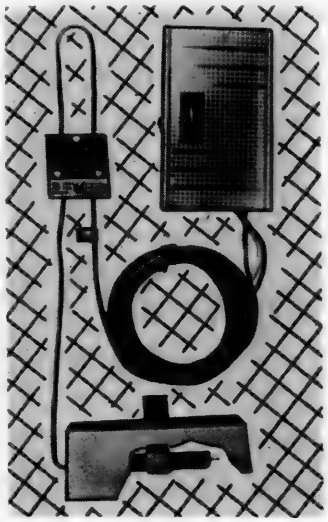
Rapid heating to required temperature levels are made possible in areas occupied only part of the day by installing heaters with two-speed motors; high speed for quick heat up, and normal speed for comfort maintenance. Two-speed motors are offered in all horizontal and some vertical delivery models.

Ordering has been simplified through the use of continuous tube construction which permits all the new models to be used for either steam or hot water, and with steam pressures up to 200 psi.

More information? Circle Item 25, postcard, last page.

Heating System Modulator

Modulation of temperature with each degree change in outdoor temperature, and further modulation with the slightest change in indoor temperature are said to be provided by Type 3W Weather-Flo, a product of Automatic Devices, Inc., Western Springs, Ill.



System would be installed instead of a system that is controlled by a room thermostat, the company states. Unlike the latter, with its *off-on* action, this system is designed to afford proportional control for hot-water or warm-air heating. Because heat flow is gentle and at a lower temperature, company asserts, dirt accumulation on walls and draperies will be minimized and a more favorable humidity balance maintained.

More information? Circle Item 26, postcard, last page.

Activated Carbon Filter

An activated carbon air filter for commercial and home conditioners is offered by Connor Engineering Corp., Danbury, Conn., for either package or central systems where the air is recirculated with no provision for outside air ventilation.

Panel-shaped Type R filter has a metal frame supporting several densely packed, columnar beds of activated carbon firmly held in wire mesh, interspersed by air by-passes. It fits directly behind the dust filter and is made in the same dimensions as four standard sizes of the latter, with capacities of 640 to 1000 cfm.

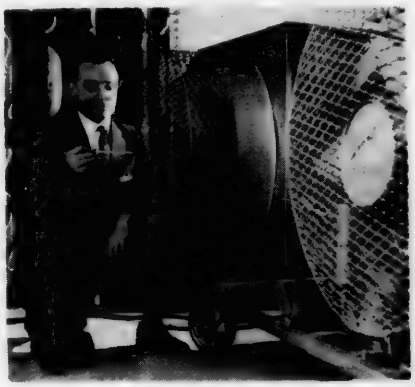
At rated capacities, resistance is 15 inches w.g. and efficiency 20%. For example, a panel installed on a 1000-cfm conditioner will provide 200 cfm of fresh, odor-free air, the company states. In instances where the filter frame of a conditioner will not accommodate both dust filter and panel, the latter is made in a smaller size with tabs for external attachment to the frame. Capacity of these units is slightly less.

When the filter medium becomes saturated, it is readily replaced by fresh carbon. Replacement periods depend on the nature of the odors and their rate of generation in the conditioned spaces.

More information? Circle Item 27, postcard, last page.

Condenser-Evaporator

A coil system which uses an interchangeable condenser and evaporator is announced by Silvercraft, Inc., Louisville, Ky. It uses no water.



Unit is said to hold pressure constant, and is equally efficient as evaporator and condenser. It is available in capacities of one ton and multiples of one ton.

More information? Circle Item 28, postcard, last page.

Versatile Room Unit

Introduction of its CR year-round room air conditioning unit by Dunham-Bush, Inc., West Hartford, Conn., is announced. It is available in several styles, including cabinet or recessed models, vertical or horizontal models, with combination cooling and heating coils, combination direct expansion and steam coils, and three control kits.

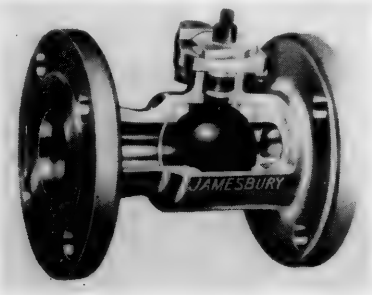
Vertical models with cabinet may be exposed or semi-recessed. Basic units may be completely recessed. Horizontal units with cabinet may be suspended from the ceiling in a conditioned space. Basic units can be used for unexposed installation. Four sizes are available, 220 through 600 cfm.

More information? Circle Item 29, postcard, last page.

Small Size Flanged Ball Valves

A line of flanged Double-Seal ball valves, in ½ to 2-inch sizes is made by Jamesbury Corp., Worcester, Mass.

Company states that smaller sizes in ball valves with standard flanges have been added to their line to meet



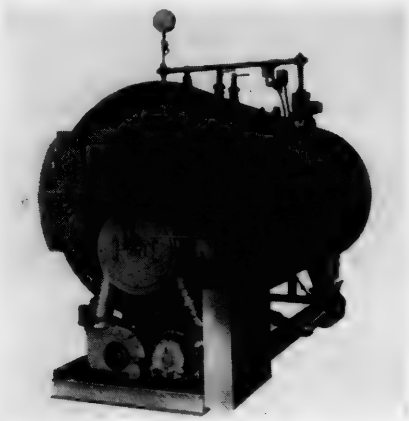
increasing demand for design featuring full pipeline flow, complete avoidance of leakage, freedom from necessity for lubrication, elimination of contamination, and minimum maintenance.

Valves, having seats and seals which are interchangeable and replaceable, are now supplied with flanged ends in pipe sizes from ½ to 8 inches, and with screwed ends in sizes from ¼ to 2 inches.

More information? Circle Item 30, postcard, last page.

Packaged Scotch Boilers

York-Power Scot-Paks, in SBI ratings from 4,860 to 42,500 sq ft of steam (52 to 400 hp, manufacturer's certified rating) are available from York-Shipley, Inc., York, Pa. These are fully automatic two-pass Scotch marine boilers. All components including boiler, firing system, refractory units, controls and control panels are designed by the manufacturer and factory-coordinated to act with each other. Boilers are completely assembled and fire tested at the factory. The finished unit may be trucked to a plant and installed within a few hours. No pitting or special foundation work is needed.



Burners can be ordered for any grade of fuel oil or natural, manufactured or mixed gas, or to burn either gas or a specified fuel oil. Combination burner allows quick shifts from oil to gas, or vice versa, to adjust to seasonal price changes.

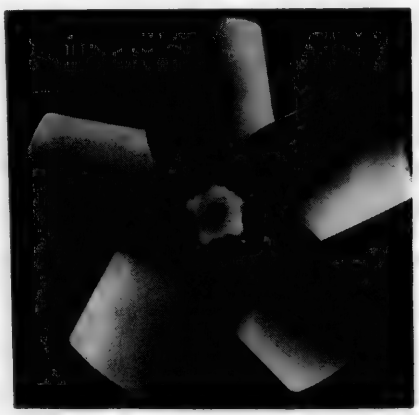
Each of 14 boiler sizes can be furnished with either forced draft, induced draft or natural draft. Forced-draft firing uses the same firing head as Steam-Pak automatic packaged boilers of this manufacture. Its blower, mounted at the front of the boiler, forces the combustion air and products of combustion through burner and boiler.

For induced-draft firing, a fan mounted on the smoke outlet pulls the air and hot gases through the boiler. A horizontal rotary burner is used with induced and natural draft. The natural-draft system is recommended only for replacement boilers where ample stack draft may be provided by an existing chimney.

More information? Circle Item 31, postcard, last page.

Fan Axial Depth Reduced

Series A fans, product of The Torrington Mfg. Co., Torrington, Conn., provide reduced axial depth with optimum air flow and high operating efficiency, the company states.



Reduced depth has been achieved with an added blade and by redesign of the symmetrically-patterned, cambered blades. They are available in 16-, 18-, and 20-inch sizes and are designed especially for such applications as attic air conditioning units, cooling towers, and central and remote air-cooled condensers.

More information? Circle Item 32, postcard, last page.

Foam Resin for Insulation

A polyester resin which is used to make rigid urethane foams for heat insulation and sound proofing is offered by Finishes Div., E. I. du Pont de Nemours & Co., Wilmington, Del. Called Delux foam resin R-42, it is capable of being foamed in place to form an integral part of the structure.

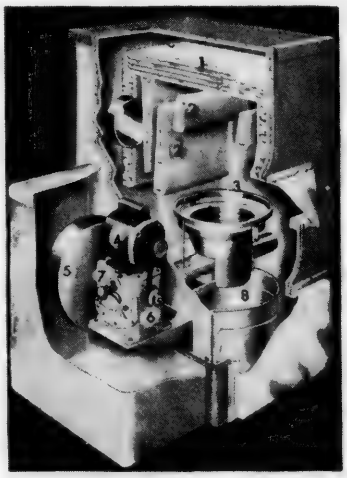
The foamed product is said to have outstanding strength, good aging characteristics, high moisture resistance, and excellent insulation properties, for temperatures of —300 to +250 deg F. At 75 deg, K factors range from 0.22 to 0.28. Material is soft to touch, easy to handle, and has tensile strengths to 25 psi, the company states.

As sold, it is available in 55-gal drums in unlimited quantities, reading for foaming.

More information? Circle Item 33, postcard, last page.

Boiler for Anthracite

An automatic anthracite-burning boiler is available from Simplex Stoker Mfg. Co., Scranton, Pa. Output capacities range from 128,400 to 350,000 Btu per hr. There are no gears, chains, or sprockets, with nothing to grease or oil except the transmission, the company states.



Components of the boiler, called Thermo-Unit, are: (1) built-in tankless coil for domestic hot water; (2) generators; (3) agitator, which trims fire for proper combustion; (4) grease-packed, ball bearing motor with overload protection; (5) fan with air adjustment; (6) transmission; (7) finger-tip coal feed adjustment; and (8) steel container above floor into which ashes drop, eliminating excavation.

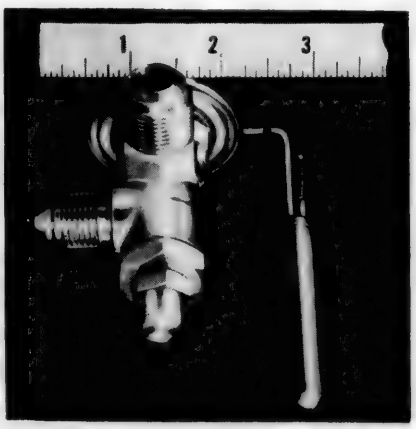
All worms are stainless steel, and bin worm can be sloped downward to the bottom of the bin to pick up maximum coal supply. Burner is dustless, self-centering ring type. Entire unit is of heavy, copper-bearing steel, electrically welded and rated according to ASME codes.

More information? Circle Item 34, postcard, last page.

Compact Expansion Valve

A compact expansion valve, said to provide very high capacity for its size, is offered by Detroit Controls Division of American-Standard, Detroit, Mich. It is available in two versions, No. 718 and 717.

Where space is limited, No. 718, 2-3/16 inches high, provides capacities from ½ to 5 tons. Its design incorporates a minimum of moving parts, the company states. It has a removable power element, and can be completely disassembled for inspection and cleaning in the field.



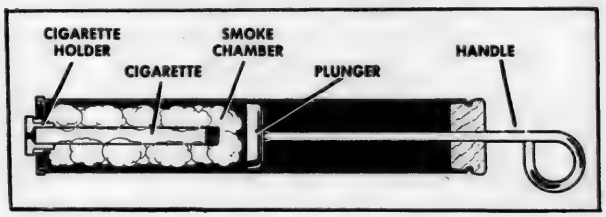
A compansion version, No. 717, is of the same capacity and basic design, well suited for general field replacement. Factory set, an Allen wrench is all that is needed for field adjustment of the superheat setting for conditions other than standard. Adjusing screw is neither sealed nor soldered.

Both versions are available with external equalizer connection.

More information? Circle Item 35, postcard, last page.

Cigarette Makes Test Smoke

A smoke test gun for use in checking air movement in heating or cooling installations, or for demonstrating performance of such systems to customers, is announced by Air Control Products, Inc., Coopersville, Mich.



This easy-to-handle unit requires only a cigarette to produce a dense, directed smoke stream to give a visual check of the air movement in any heating or cooling installation. To load, unscrew holder from pump, insert lighted cigarette, and screw holder back into end of pump. A few strokes of the plunger handle will force the smoke through the jet.

Gun can be used without danger of damage to home furnishings, according to the manufacturer.

More information? Circle Item 36, postcard, last page.

Custom Made Filters

Custom made metal frame filters have been added to the line of electrostatic Dust-Magnet filters manufactured by Stoddard Industries, Chicago, Ill. A ½-inch metal frame filter is available in small quantity lots for air conditioners and warm air furnaces.

The custom made filters will be made of polystyrene as are all the company's units. The plastic fibers maintain a charge which attracts dust particles that the company claims would pass through ordinary materials. Filters resist humidity and excess heat, and require no treatment or service other than occasional washing under a faucet.

More information? Circle Item 37, postcard, last page.

Versatile, Portable Pump

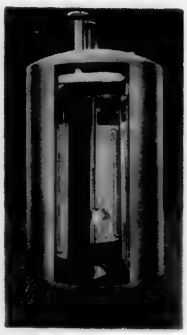
Model 109 submersible pump, product of Kenco Pump Div., The American Crucible Products Co., Lorain, Ohio, fits any shallow sump 11 inches wide, is completely submersible, pumps 3300 gph at 10-ft discharge head, and features cast-bronze construction.

In addition to its domestic use in basement sumps and septic tanks, pump is built for industrial service in transformer vaults, utility tunnels, cooling towers, and removal of air conditioning condensate and factory wastes.

More information? Circle Item 38, postcard, last page.

Panel Coils for Process

Available from Dean Thermo-Panel Coil Div., Dean Products, Inc. Brooklyn, N.Y., are panel coils, said by the company to replace pipe coils. Coils require little cleaning; however when cleaning is required, panel coils afford quick and easy removal and replacement, assuring minimum downtime.



As shown in illustration, a process reactor fitted with panel coils allows a relatively large volume within the tank in addition to a large heating or cooling surface. Also serving as baffles, the panels have an economic influence on product agitation.

Manufacturer asserts that panels usually cost less than pipe coils and weigh less in addition to efficient and economical cooling or heating.

More information? Circle Item 39, postcard, last page.

Weather Data Measurement

A colorful Weatherman system that measures and indicates the speed and direction of the wind, temperature, relatively humidity, rainfall, and barometric pressure is announced by Friez Instrument Division of the Bendix Aviation Corp., Baltimore, Md.

The outside weather data is presented indoors on 11-inch dia color dials that can be flush-mounted. The numbered scales of the indicators are covered with a fluorescent yellow paint, which also is used on the inner-scale graduations on the face of the dial. A fluorescent orange paint highlights the leading edges of the indicator pointer.

The basic Weatherman system consists of six units, However, indicators and transmitters also can be supplied separately as individual units. The wind indicating unit (Model 164) includes a transmitter, support, wind speed and wind direction indicators, and a length of connecting cable. The transmitter measures both wind speed and wind direction simultaneously over a range from two to 100 mph. The temperature unit (Model 165) includes a transmitter, electronic amplifier, indicator, and a cable measured to the length required for each installation. It will measure the temperature from minus 20 to plus 120 deg F.

The barometric pressure unit (Model 166) consists of the only indicator that is not activated by a remote transmitter. It is completely self-contained, and measures pressure over a range from 26 to 32 inches of merucury with an accuracy of plus or minus .05 inches at 70 deg F. The relative humidity unit (Model 167) includes a transmitter, electronic amplifier, indicator, and cable. It has an accuracy of plus or minus 5% over a range from 25 to 80% R.H. when the ambient temperature around the transmitter is between 32 and 122 deg F. The transmitter contains a sensing element of human hair which varies in length with changes in the relative humidity.

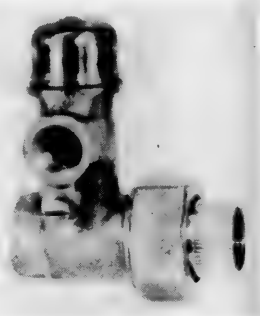
The rainfall unit (Model 168) includes a tipping bucket rain gage transmitter, a rectifying transformer, indicator and cable. A knob, connected to the indicator pointer, permits an operator to reset the unit to show total rainfall over a period of time, such as daily, weekly, or monthly.

Optional accessories of the system include a special mast adapter for mounting the wind transmitter, a 28-ft utility tower for the transmitters, additional thermistor probes, and an instrument shelter.

More information? Circle Item 40, postcard, last page.

Water Heater Relief Valves

Fourteen new temperature and pressure relief valves for domestic water heater application are announced by The Patrol Valve Co., Cleveland, Ohio.



Models BTR-1 to BTR-7 incorporate a tee and dielectric insulating union all in one, providing a complete unit. Union tail piece sizes are ½ to 1 inch, and are available in either steel or brass NPT sizes or in brass tubing sizes. Models BTRL-1 to BTRL-7 have the additional feature of a test lever. Fuse plugs are exposed so that valve does not have to be removed from the line for plug replacement.

These valves, as well as the company's standard series of temperature and pressure relief valves, are described in Catalog PV-C-412.

More information? Circle Item 41, postcard, last page.

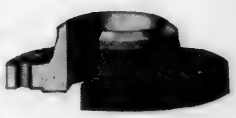
(Continued on page 92)

90° butt-welding elbow—Crane offers 16 different butt-welding fittings—½" to 24" for all pipe strengths.

Socket-welding tee—The Crane line of socket-welding fittings includes 9 different types for sizes ⅛" to 4"; 2000, 3000, 4000, 6000 lb. W. O. G.—non-shock—temps. 100° to 1000° F.

Crane butt-welding globe valve—The Crane butt- and socket-welding end valve lines include bolted bonnet, lip-seal, pressure-seal and union bonnet valves in a variety of globe, gate, angle and check designs.

Forged steel welding-neck flange—One of 3 standard types of forged steel flanges available from Crane for welded piping.



Send for this NEW Crane Circular of Welding Fittings, Flanges, Valves

A concise four-page guide to Crane's complete stocks of welding fittings, flanges and valves is available for your reference use. It provides you with a fast, accurate method of ordering *all* of your welding piping materials *from one source of supply.*

Ordering everything from Crane is your assurance that your jobs will be installed with top-quality materials throughout. Crane branch warehouses in 140 cities and Crane wholesalers throughout the country are ready to serve your requirements for welded piping materials.

Make sure that you get your copy of the new Crane Welded Piping Materials Circular quickly. Fill in and mail the coupon today. If you want an extra copy for your welding shop, check the coupon as indicated.

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill.
Branches and Wholesalers Serving All Areas

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836 S. Michigan Ave., Chicago 5, Ill.

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Your Name_____

Firm Name_____

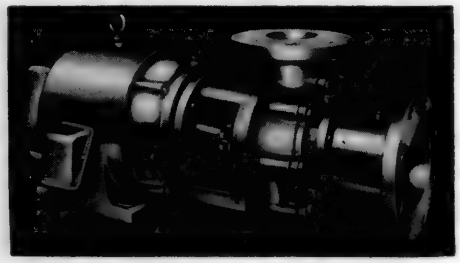
Address_____

City_____ Zone____ State____

(Continued from page 90)

General-Purpose Pumps

End-suction, Type BC, general-purpose pumps in close-coupled horizontal, flange-mounted vertical, base-mounted vertical, and pedestal-mounted horizontal units, are announced by Aurora Pump Div., The New York Air Brake Co., Aurora, Ill. Sizes range from ¼ to 40 hp at 3500 rpm, ¼ to 20 hp at 1750 rpm.



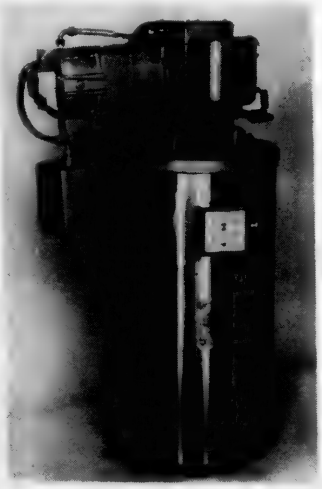
Pumps are recommended for circulating coolant, for cooling towers, as boosters, for hot-water and for tank-mounted applications, for swimming pools, and others. The pumps possess low net positive suction head characteristics, the company states, to meet critical suction conditions. By means of interchangeable inserts, pumps may be changed from packing to seals. Inserts include mechanical seal, packing, water-cooled stuffing box with mechanical seal, and water-cooled packing box.

Other pump characteristics: Shaft sleeves of bronze; case wearing rings of nickel-iron; wide gasket seals; steep-sloping, constantly-rising head to shut-off; and low impeller velocities.

More information? Circle Item 42, postcard, last page.

Ship Heater for Yachts

A deluxe model of its 917-6C ship heater is available from Way-Wolff Associates, Inc., New York, N. Y. The 36-inch high unit is suitable for heating yachts from 40 to 80 ft in length.



Included is a stainless steel or chromium-plated jacket, all solid brass chrome plated fastenings and fittings including gages and flexible metallic conduit. The unit comes completely wired with U. S. Navy-approved, waterproof flexible marine conduit with filters meeting Navy requirements for radar- and radio-interference-free shielding. It can be installed in either a vertical or horizontal position.

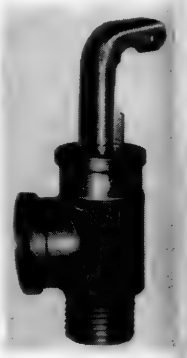
Development of this heater was brought about by yachtsmen who wanted equipment decorative as well as useful. The unit is complete with fully automatic diesel oil burner, marine controls, insulating cabinet, completely wired for simple installation aboard your vessel. Accessories, such as tank and heater combinations for domestic hot water supply, panel-vectors for heat in the various spaces, etc. are available from stock.

Specifications are contained in Bulletin DM-31.

More information? Circle Item 43, postcard, last page.

Water System Relief Valves

Three water system relief valves, equipped with a unique combination test lever and adjusting key, are announced by Mansfield Sanitary, Inc., Perrysville, Ohio.



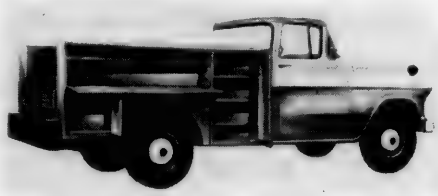
No. 452 protects against excessive pressures in (preferably) cold water lines. No. 453 and 495 are for both temperature and pressure relief. A calibrated test lever, shaped to fit exactly into the slot on top of the pressure cap, permits easy adjustment of the t-p relief valve. Pressure settings vary from 50 to 200 psi. No. 495 is identical to No. 453 except that it is made with a fusible plug at the end of a 6-inch extension tube for immersion of the plug into the hottest part of the tank. Plugs in both melt at 210 deg F. They are removable without removing valves from the line.

More information? Circle Item 44, postcard, last page.

Utility Model Truck Bodies

A series of improved truck bodies, designed for the plumbing, heating and air-conditioning industries, is introduced by Reading Body Works, Inc., Reading, Pa.

Extra rigidity has been added to all 18 utility models by the addition of two full width cross-sills. General construction of bodies, which ranges from one-half to one-ton units, is of 12-, 14- and 16-gage steel, with understructure of 12-gage steel.



Variable compartment and shelving arrangements provide large storage and load areas. Compartment capacity ranges from 35 cu ft in half-ton models to 68 cu ft in one-ton models.

Designed for mounting on any standard chassis, the all-welded units are available in fully enclosed panel bodies with permanent roof or canopy tops for both single and dual wheel chassis. Overall body lengths at the floor line are 78 to 108 inches. Inside floor areas range from 26 to 38 sq ft.

More information? Circle Item 45, postcard, last page.

(Continued on page 94)

for hard-to-heat locations

MODINE POWER-THROWS

BACK-TO-BACK, and using one set of piping, two Power-Throws can heat a 280-ft. long area, as shown on this warehouse floor plan.

. . . twice the range of conventional unit heaters

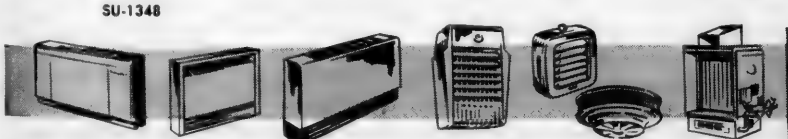
If you have a difficult heating problem, the Modine Power-Throw unit heater may be your answer. It is designed to provide a powerful horizontal discharge of heated air at higher than normal velocities. Its exceptionally long heat-throw—up to 140 feet—permits heat distribution over a wide area.

Power-Throws are used in large plants and warehouses—often to blanket frequently opened doors with a curtain of warm air. Their high capacities—271,200 to 609,600 Btu—permit them to replace a number of standard units with resulting economies in equipment and installation costs.

High-corrosion-resistant models. For those plants faced with severe internal corrosion problems requiring the frequent replacement of heating equipment—Modine offers the Power-Throw in HCR (High Corrosion Resistant) models.

Ask the Modine representative listed in the Yellow Pages for Catalog 157 that also covers the broad range of standard Modine horizontal and vertical delivery unit heaters. Or write Modine Mfg. Co., 1511 DeKoven Ave., Racine, Wisconsin.

SU-1348



AirConditioners | Convectors | Cabinet units | Gas unit heaters | Steam & hot water unit heaters | Duct furnaces

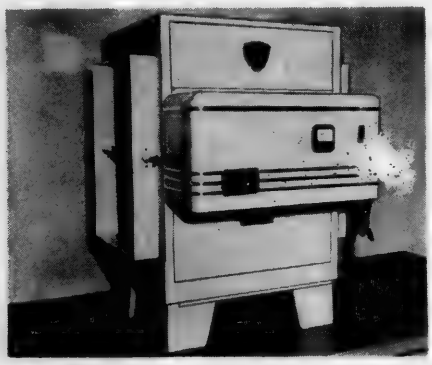
In Canada: Sarco, Ltd., Toronto

Modine
MANUFACTURING COMPANY

(Continued from page 92)

Economy Air Cleaner

An economy-size model electronic air cleaner is the ninth in its Model 6 line by Trion, Inc. of McKees Rocks, Pa. Known as Model 6-100, the unit has a capacity of 800 to 1000 cfm and is sized to fit a furnace with a Btu



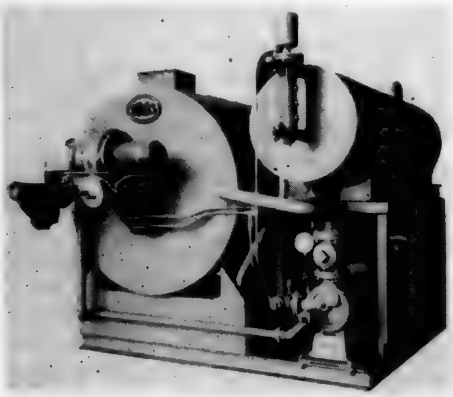
rating of 80,000 to 100,000, or a central air cooling unit of 2-ton capacity.

The new model is enclosed in an eggshell and bronze finished cabinet that may be floor mounted or suspended. Styling of its cabinet permits installation in the home's recreation area. Company says it has an efficiency rating of 90% in the removal of pollen, germ-laden dirt, dust, and smoke.

More information? Circle Item 46, postcard, last page.

Low-Pressure Oil Heater

An improved oil heater, called Hi-Heet, said to generate temperatures to 500 deg F 60% faster than equivalent steam boilers, is announced by Bros Incorporated, Minneapolis, Minn. It operates at pressures below 15 psi, eliminating the need for a first-class engineer.



Many companies now use oil heaters in highway construction, lumber and paper mills, paint and varnish plants, and soap factories, company states. Oil heaters produce exact quantities of heat automatically for warming large tanks of viscous materials. Oil heaters are also used for asphalt and resin impregnation and drying, lumber drying, manufacturing and compounding lubricants, hot corrugating and gluing paperboard, plastics molding, and extruding organic synthesis, and cooking.

Heater operates automatically. It has an all-electric control system mounted in a centralized, weatherproofed control box. The electrical system contains performance controls and such safety controls as a flame failure control, a low oil level control, and an extreme temperature control.

Fuel burned is light oil, heavy oil, gas, or a combination. Five models are available with outputs of from 1,050,000 to 3,650,000 Btu per hr.

More information? Circle Item 47, postcard, last page.

Portable Filter with Cyclone

Model WWB5 Dustender, low-cost, portable dust collector designed to handle large bulking dusts especially when accompanied by a great percentage of fines, is added to its line by Dustender Co., Ann Arbor, Mich.

Unit features a minimum floor space requirement, a 1/3-hp continuous duty, ball-bearing motor, directly driving a paddle-wheel fan that clears itself of chips and scraps of waste materials. A built-in cyclone separator affords a great reduction of dust load on the filter, the company states. Filter itself is a flameproofed material of dense weave to remove dust particles not taken out by the cyclone separator.

Unit is caster mounted for moving from one machine to another on short notice or for general shop vacuuming clean-up with flexible-hose-equipped nozzle.

Recommended uses are in the woodworking, chemical, leather, and fiber goods industries where the recirculation of cleaned air from the collection of large volume dusts at remote locations is permissible.

More information? Circle Item 48, postcard, last page.

Redesigned Condensing Units

Redesign of its 3/4-hp condensing units, which has increased their accessibility and ease of installation and servicing, is announced by Evansville Div., Bendix-Westinghouse Automotive Air Brake Co., Evansville, Ind.

The new models, BRH75T and BRL75T, have a nested-fin type condenser consisting of all primary surface, in conjunction with a recently developed three-blade fan, which has allowed reduction of one row of condenser without impairment of performance. Results are less noise from air flow and more room between components. Overall dimensions (inches) are 24 by 17 by 13½ high.

Starting relay and capacitor are mounted on the terminal box cover, making motor compressor and its accessories an integrated unit. The need for a running capacitor has been eliminated.

More information? Circle Item 49, postcard, last page.

(Continued on page 96)

AMERICAN AIRLINES

ventilating problem

solved with

JOY AXIVANE FANS

The Tulsa Overhaul and Supply Depot is a nerve center for refurbishing the American Airline Flagship Fleet. Here, hot climate and concentration of technicians working inside the airplanes necessitate serious attention to good ventilation.

Anxious to provide maximum comfort and safety and to conserve floor and storage space, American revised their system. Investigation led to the selection of a Joy AXIVANE fan, equipped with an explosion-proof motor.

The compact vaneaxial design of the AXIVANE fan permitted a permanent, "out-of-the-way" installation in the hangar ceiling trusses. The fan exhausts through 27 feet of 'Spiratube' attachable to an airplane emergency exit. In addition to pulling stale air, fumes, and dust out of the cabin, the fan circulates fresh air through the hangar.

American has added six more AXIVANE fans and has equipped both the Convair and DC-7 hangars with this Joy cabin-ventilator system to replace larger, troublesome, less efficient portable blowers.

There is a Joy AXIVANE fan for any aviation, electronic or industrial application. For details, write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

WSW A55018—208

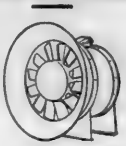
JOY... EQUIPMENT FOR INDUSTRIAL PLANTS... FOR ALL INDUSTRY

WRITE FOR FREE BULLETIN 208-40

Industrial Compressors

Conveyors

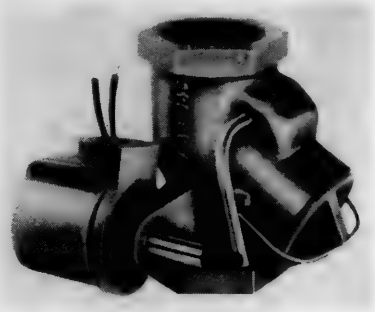
Electrical Connectors


Fans and Blowers

(Continued from page 94)

Solenoid Operated Drain Valve

A solenoid operated drain valve is available from Automatic Switch Company of Florham Park, N. J. The valve was originally designed for use in industrial and commercial type laundries where the dumping of waste water from washing machines is automatically controlled. However, it may be used wherever controlled draining or dumping of liquids is required.



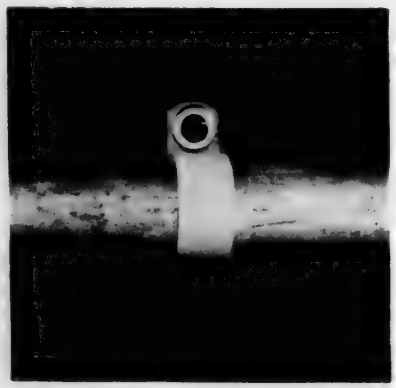
Model 8339 is a direct acting type, solenoid controlled valve having good draining characteristics. The absence of cavities or obstructions in the valve itself eliminates the collection of foreign matter, thereby providing a clean and quick drain. A quick clean-out plug, easily accessible, not only eliminates messy maintenance, but further assures clean drainage.

The valve has all iron construction, and stainless steel seat, including a watertight solenoid enclosure. Soft composition disc and stainless steel seat provide tight shut-off on 5 inches of head pressure. Dumping capacity ranges to 118 gpm. Available in 1½- and 2-inch sizes, valve operates on 15 watts a-c and may be supplied for most standard voltages and frequency.

More information? Circle Item 50, postcard, last page.

Nylon Pipe Hangers

Molded nylon hangers for support of tubing and piping are available to contractors through Amstan Supply Division of American-Standard. Each clip weighs 0.8 oz, yet will support 250 lb, and retain its shape.

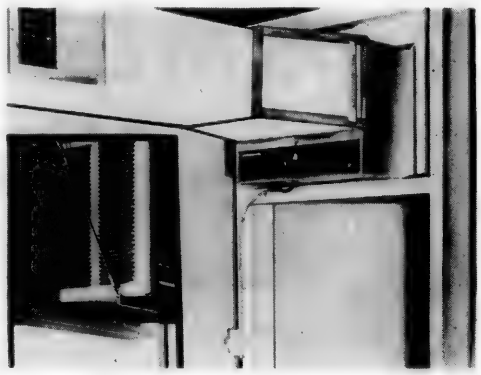


Tube and pipe diameters accommodated range from ⅛ to 2 inches in intervals of 1/16 inch, in 1-, 2-, and 3-hole types. Resisting effects of temperatures from —65 to +250 deg F for sustained periods, hangers are also unaffected by oils, gasoline, alcohol, or hydraulic fluids. They are manufactured by Burndy Corp., Norwalk, Conn.

More information? Circle Item 51, postcard, last page.

Conditioner for Small Spaces

The Ductaire, product of Westinghouse Electric Corp., Pittsburgh, Pa., is a 2-hp, self-contained air conditioner for small business. It is sold complete with prefabricated, insulated ducts.



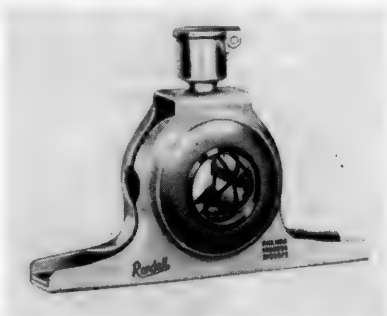
Unit, as illustrated, requires only electrical connections, and does not require any connections for water or drain. Inset shows the same unit projecting outside of transom. It will deliver 590 cfm of cooled air, enough, the company states, to air condition 1400 sq ft of floor space.

More information? Circle Item 52, postcard, last page.

Additional Pillow Block Sizes

Randall Graphite Bearings, Inc., Lima, Ohio, has added two sizes to its Series 240 steel housing pillow blocks. The units are for shaft sizes $1\frac{3}{16}$ and 1¼ inches.

The new sizes have graphited cast-bronze bushings and incorporate all the operating advantages provided



by the company's deep-well pillow blocks with graphited bushings. These advantages include automatic controlled double lubrication, automatic self-alignment under all conditions, quiet, maintenance-free operation for long periods, and mounting in any required position—horizontal, vertical or inverted.

More information? Circle Item 53, postcard, last page.

THE MARK OF QUALITY

BARBER COLMAN

Electronic Control APPLICATIONS

NEW CONTROL PACKAGE

for face and bypass unit ventilators

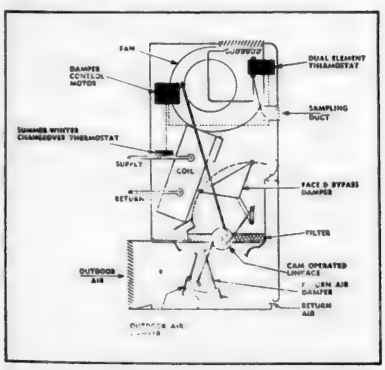
First again from Barber-Colman — a new *Automatic Control Package* specifically designed for controlling combination hot and chilled water unit ventilators. This is a control package, combining a dual-element, unit-mounted room and discharge controller with an oil-submerged spring return motor operator and a change-over thermostat to provide a precise control system for both room and discharge temperatures, in today's modern classrooms, that cannot be equaled by any other control system.

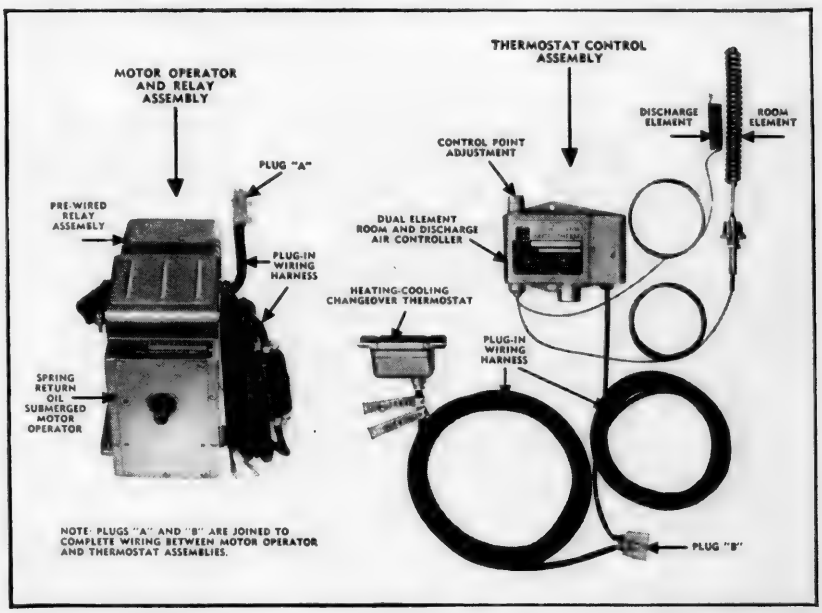
CONTROL PACKAGE

The Control Package, shown at the right, consists of two separate assemblies: (1) the control motor with change-over relay, (2) dual-element, unit-mounted controller, and strap-on thermostat. Both assemblies are prewired and equipped with plug-in cables to facilitate easy installation of the complete control system.

FEATURES AUTOMATIC CHANGE-OVER

Control change-over from heating to cooling is automatic. The strap-on thermostat, mounted in each unit and set to change over at 65° F., senses whether the supply medium is hot or chilled water and activates the unit ventilator control system accordingly. The spring return motor operator insures positive closing of the outdoor air damper on fan shutdown and assures maximum convection during night cycle when fans are stopped.




MOTOR OPERATOR AND RELAY ASSEMBLY
THERMOSTAT CONTROL ASSEMBLY
DISCHARGE ELEMENT
ROOM ELEMENT
CONTROL POINT ADJUSTMENT
PLUG "A"
PRE-WIRED RELAY ASSEMBLY
DUAL ELEMENT ROOM AND DISCHARGE AIR CONTROLLER
PLUG-IN WIRING HARNESS
HEATING-COOLING CHANGEOVER THERMOSTAT
PLUG-IN WIRING HARNESS
SPRING RETURN OIL SUBMERGED MOTOR OPERATOR
NOTE: PLUGS "A" AND "B" ARE JOINED TO COMPLETE WIRING BETWEEN MOTOR OPERATOR AND THERMOSTAT ASSEMBLIES.
PLUG "B"

DUAL-ELEMENT THERMOSTAT

The single dual-element, unit-mounted room thermostat gives precise control of both room and discharge temperatures under all conditions that cannot be equaled at the same cost by any other type of system. Note also that the dual-element thermostat, being mounted within the unit, is immune to tampering by unauthorized personnel, chalkdust and dirt problems, difficulty in finding wall space for mounting thermostat, etc., thus eliminating all the thermostat problems usually associated with school classroom control.

Either ASH&AE cycle "X" or "Y" can be achieved through a single control motor operating the standard cam-operated linkage to sequence the OA, RA, and face and bypass dampers. Standard linkage is available for fixed minimums of 0%, 20%, 24%, 33⅓%, 50%, and 100%.

ENTIRE PACKAGE FACTORY-MOUNTED

The entire control package is installed on the unit ventilator by the manufacturer at his factory prior to shipment, but the local Barber-Colman comfort engineer assumes complete responsibility for the controls and their proper operation. If service should ever become necessary, the replacement of a defective component is fundamentally simplified as the plug-in cable wiring harness allows field removal and replacement of any component in a matter of minutes.

Advantages of the face and bypass-type unit ventilator are many. The possibility of installing the face and bypass unit at relatively the same cost as the older standard units should appeal to everyone who recognizes the many advantages of face and bypass control. To get the complete unit ventilator control story, including all data and specifications, call your local Barber-Colman comfort engineer or write direct for Data Sheet F 8527.

BARBER-COLMAN COMPANY

Dept. A, 1302 Rock Street, Rockford, Illinois • Field Offices in principal cities

Automatic Controls • Air Distribution Products • Small Motors • Industrial Instruments • Aircraft Controls • Electrical Components • Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

DEGREE-DAYS FOR NOVEMBER, 1957

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING'S 30th Year of Publication of Monthly Degree-Day Data

City	November			Season to Nov. 30, incl., from Sept. 1		
	1957	1956	Normal	1957	1956	Normal
Abilene, Texas (A)	487	386	350	634	422	503
Albany, New York (A)	691	749	780	1293	1475	1362
Albuquerque, New Mexico (A)	739	715	630	1012	910	858
Alpena, Michigan (C)	815	857	864	1625	1633	1609
Asheville, North Carolina (C)	509	586	552	967	865	864
Atlanta, Georgia (A)	335	436	393	578	490	511
Atlantic City, New Jersey (C)	427	527	507	725	780	766
Augusta, Georgia (A)	284	363	282	471	422	341
Baltimore, Maryland (C)	419	469	489	685	657	725
Billings, Montana (A)	916	820	876	1727	1385	1567
Binghamton, New York (C)	674	690	735	1294	1301	1304
Birmingham, Alabama (A)	344	436	396	585	500	532
Bismarck, North Dakota (A)	1012	1032	1098	1881	1804	1923
Block Island, Rhode Island (A)	491	571	591	874	1002	1009
Boise, Idaho (A)	850	883	762	1385	1431	1286
Boston, Massachusetts (A)	529	560	618	903	1064	1010
Buffalo, New York (A)	717	688	753	1313	1196	1308
Burlington, Iowa (A)	783	749	765	1287	969	1184
Burlington, Vermont (A)	764	807	858	1436	1585	1551
Cairo, Illinois (C)	501	507	492	734	562	681
Charleston, South Carolina (C)	180	250	214	272	266	248
Charlotte, North Carolina (A)	361	449	438	627	582	592
Chattanooga, Tennessee (A)	429	514	477	717	625	670
Cheyenne, Wyoming (A)	1049	989	897	1886	1570	1715
Chicago, Illinois (C)[b]	736	683	765	1222	895	1205
Cincinnati, Ohio (C)	543	556	567	865	699	831
Cleveland, Ohio (A)	657	665	699	1156	1022	1114
Columbia, Missouri (A)	687	635	654	1055	747	978
Columbia, South Carolina (A)	287	372	308	467	440	384
Columbus, Ohio (C)	627	634	654	1071	881	1012
Concord, New Hampshire (A)	714	799	849	1363	1654	1568
Concordia, Kansas (C)	769	700	687	1163	869	1019
Dallas, Texas (A)	371	355	299	498	369	352
Dayton, Ohio (A)	689	974	693	1176	974	1090
Denver, Colorado (A)	838	829	771	1399	1174	1316
Des Moines, Iowa (A)	877	807	798	1439	1072	1252
Detroit, Michigan (A)	713	716	747	1275	1128	1224
Devils Lake, North Dakota (C)	1134	1121	1197	2129	2035	2127
Dodge City, Kansas (A)	757	688	669	1148	832	971
Dubuque, Iowa (A)	911	889	882	1601	1301	1475
Duluth, Minnesota (C)	1094	1097	1092	2120	2005	1983
Elkins, West Virginia (A)	(a)	751	726	(a)	1242	1260
El Paso, Texas (A)	476	494	390	603	559	460
Ely, Nevada (A)	1072	1025	894	1983	1821	1683
Escanaba, Michigan (C)	900	893	933	1753	1660	1735
Evansville, Indiana (A)	615	623	570	976	799	844
Fargo, North Dakota	1074	1025	1122	1916	1721	1923
Fort Smith, Arkansas (A)	463	499	435	659	541	575
Fort Wayne, Indiana (A)	754	739	759	1361	1102	1243
Fort Worth, Texas (A)	402	374	299	546	395	357
Fresno, California (A)	386	347	345	465	482	431
Galveston, Texas (C)	145	147	131	194	147	131
Grand Junction, Colorado (A)	854	914	792	1249	1203	1161
Grand Rapids, Michigan (A)	792	755	822	1499	1241	1428
Green Bay, Wisconsin (A)	912	935	945	1761	1602	1643
Greensboro, North Carolina (A)	448	551	510	824	798	741
Greenville, South Carolina (A)	368	458	411	645	614	552
Harrisburg, Pennsylvania (A)	593	631	630	1045	1072	1007
Hartford, Connecticut (A)	596	698	699	1143	1433	1184
Hatteras, North Carolina (C)	(a)	264	244	(a)	273	307
Havre, Montana (C)	925	885	1023	1882	1633	1857
Helena, Montana (A)	976	967	999	1978	1691	1936
Houston, Texas (C)	246	174	162	246	174	162
Huron, South Dakota (A)	951	970	975	1642	1501	1596
Indianapolis, Indiana (A)	721	711	705	1226	958	1090
Jackson, Mississippi (A)	301	377	310	467	407	379
Kansas City, Missouri (A)	651	622	621	982	702	905
Knoxville, Tennessee (A)	430	524	498	715	630	710
La Crosse, Wisconsin (A)	917	913	921	1604	1339	1520
Lander, Wyoming (A)	1198	1068	1050	2041	1685	1926
Lewiston, Maine (O)	730	802	876	1426	1632	1542

(a) Data not available. [b] 1957 and normal figures are for Midway Airport; 1956 figures are for Grant Park Station.

Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively. [Table concluded on page 100]

PROVE IT TO YOURSELF

...how much stronger...how much safer

Glasfloss® fiber glass Safety-Grille* filters really are

*TRADE MARK

MAKE THESE TESTS...

1. Bend it—and the new Glasfloss Safety-Grille Filter bounces right back to its original shape. Old type metal-grille filters don't. Unless you re-bend them, they stay bent out of shape and can cut down filtering efficiency. Strong construction of Glasfloss Safety-Grille Filters means less chance of damage in transit, in storage, in handling.

2. Feel the grille edge—it's chipboard, and perfectly safe! No sharp edges—no cuts, no scratches to worry about!

For maintenance personnel, the new Glasfloss Safety-Grille eliminates any danger of cut hands or wrists and possible infection when changing filters.

Plus these features... Glasfloss Safety-Grille Fiber Glass Filters . . .

—have same available filtering area and initial pressure drop as old-type filters
—are tested and proven in service
—are approved by Underwriters' Laboratories, Inc.

Make these tests: Try PPG's new Glasfloss Fiber Glass Safety-Grille Filters in your heating and air conditioning systems. Get top filtering results! They're available in a complete range of sizes from your local distributor or PPG Warehouse.

A Product of Pittsburgh Plate Glass Company

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh and St. Louis

FIBER PPG GLASS · PITTSBURGH PLATE GLASS COMPANY

Degree-Days for November, 1957 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING'S 30th Year of Publication of Monthly Degree-Day Data

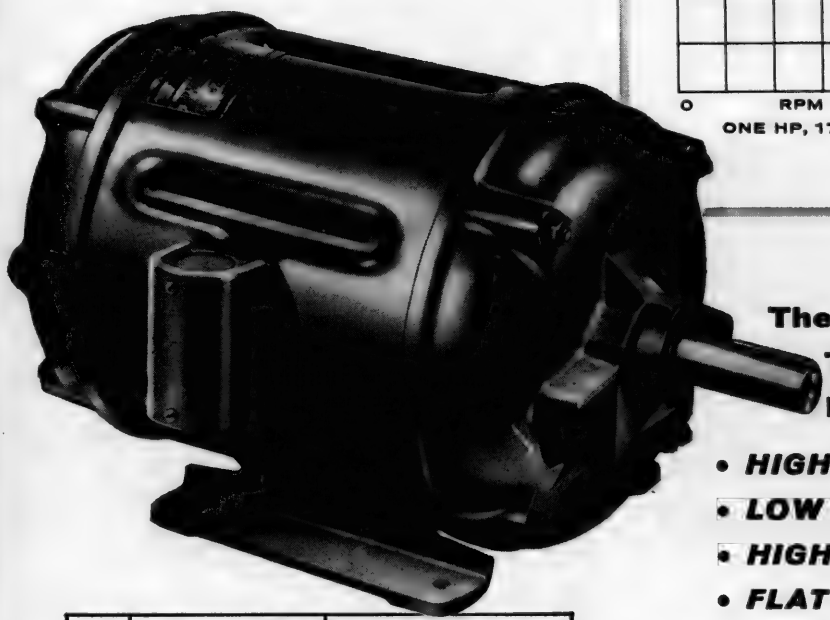
City	November			Season to Nov. 30, incl., from Sept. 1		
	1957	1956	Normal	1957	1956	Normal
Lincoln, Nebraska (C)	816	719	741	1278	917	1130
Little Rock, Arkansas (A)	378	433	405	542	466	525
Los Angeles, California (C)	131	42	140	147	76	198
Louisville, Kentucky (A)	577	624	579	915	818	862
Lynchburg, Virginia (A)	488	575	531	918	883	816
Macon, Georgia (A)	246	348	280	396	376	343
Madison, Wisconsin (A)	883	870	864	1615	1288	1420
Marquette, Michigan (C)	933	920	933	1708	1645	1712
Memphis, Tennessee (A)	407	439	432	604	487	575
Meridian, Mississippi (A)	288	395	338	459	434	428
Milwaukee, Wisconsin (A)	848	840	831	1544	1315	1393
Minneapolis, Minnesota (A)	963	920	960	1647	1393	1576
Moline, Illinois	800	790	786	1403	1088	1245
Montgomery, Alabama (A)	234	373	304	384	399	373
Nashville, Tennessee (A)	488	512	471	768	595	647
New Haven, Connecticut (A)	549	639	663	1013	1167	1119
New Orleans, Louisiana (C)	135	186	141	204	186	146
New York, New York (C)	464	545	561	779	863	863
Newark, New Jersey	495	565	603	833	926	951
Norfolk, Virginia (A)	329	422	408	552	512	569
North Platte, Nebraska (A)	802	880	846	1467	1315	1391
Oak Ridge, Tennessee	432	493	550	698	582	775
Oakland, California (A)	337	329	336	442	573	569
Oklahoma City, Oklahoma (A)	572	531	459	852	603	620
Omaha, Nebraska (A)	828	752	783	1323	991	1202
Parkersburg, West Virginia (C)	574	596	600	1012	865	928
Peoria, Illinois (A)	758	747	759	1236	950	1184
Philadelphia, Pennsylvania (C)	458	491	516	754	741	768
Phoenix, Arizona (A)	253	214	182	265	261	195
Pittsburgh, Pennsylvania (C)	568	595	612	1026	905	966
Pittsfield, Massachusetts	759	816	843	1512	1642	1599
Pocatello, Idaho (A)	1032	1019	873	1736	1707	1543
Portland, Maine (A)	721	806	825	1373	1632	1539
Portland, Oregon (C)	547	569	534	852	979	899
Providence, Rhode Island (A)	576	630	672	1037	1218	1160
Pueblo, Colorado (A)	824	836	771	1227	1106	1228
Raleigh, North Carolina (A)	397	489	387	730	676	515
Rapid City, South Dakota (A)	876	950	891	1218	1433	1584
Reading, Pennsylvania (C)	534	604	588	936	974	930
Red Bluff, California (A)	403	273	319	552	410	378
Reno, Nevada (A)	845	838	744	1517	1482	1352
Richmond, Virginia (A)	434	519	498	901	740	741
Rochester, New York (A)	721	715	759	1356	1296	1332
Roswell, New Mexico (A)	600	603	501	833	710	665
Sacramento, California (C)	361	294	321	466	417	413
St. Joseph, Missouri (A)	750	703	600	1169	854	882
St. Louis, Missouri (C)	607	570	570	905	655	810
Salt Lake City, Utah (A)	909	915	771	1411	1372	1240
San Antonio, Texas (A)	270	230	201	341	233	226
San Diego, California (A)	126	75	147	134	112	223
Sandusky, Ohio (C)	680	683	684	1184	998	1077
San Francisco, California (C)	239	172	237	376	432	475
Sault Ste. Marie, Michigan (A)	897	953	1005	1805	1866	1942
Savannah, Georgia (A)	209	302	225	319	330	263
Scranton, Pennsylvania (A)	685	736	693	1303	1371	1197
Seattle, Washington (C)	557	567	540	924	1093	1003
Sheridan, Wyoming (A)	975	915	957	1860	1557	1774
Shreveport, Louisiana (A)	310	334	305	425	357	358
Sioux City, Iowa (A)	868	838	885	1461	1149	1418
Spokane, Washington (A)	877	963	879	1595	1684	1592
Springfield, Illinois (A)	721	706	666	1185	887	981
Springfield, Missouri (A)	642	627	615	993	735	925
Syracuse, New York (A)	685	710	714	1273	1308	1227
Toledo, Ohio (A)	741	745	756	1357	1191	1245
Topeka, Kansas (C)	683	639	630	1037	744	914
Trenton, New Jersey (C)	493	565	582	864	928	922
Tulsa, Oklahoma	515	509	462	745	550	632
Utica, New York (O)	740	837	781	1306	1438	1393
Valentine, Nebraska (A)	902	957	891	1599	1447	1497
Walla Walla, Washington (C)	673	795	675	1161	1229	1076
Washington, D. C. (C)	462	520	510	810	757	773
Wichita, Kansas (A)	687	628	597	1045	721	848
Williston, North Dakota (C)	1015	981	1101	1918	1782	1967
Winnemucca, Nevada (A)	957	922	822	1714	1631	1510
Yakima, Washington (A)	844	890	807	1448	1532	1403

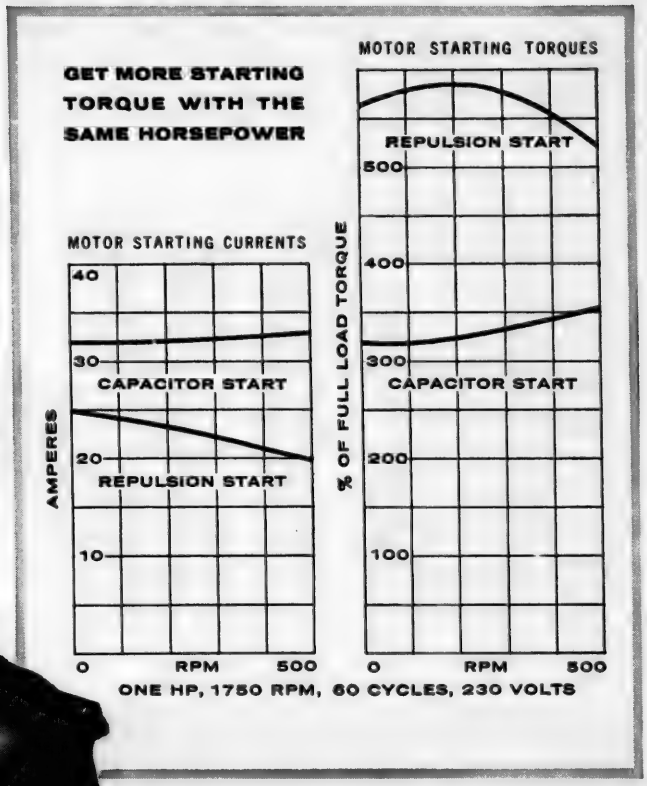
For footnotes, see page 98.

WAGNER SINGLEPHASE MOTORS

This two-in-one motor is your best choice

FOR HARD-TO-START LOADS





The Wagner Heavy Duty Type RA Repulsion-Start Induction Motor offers:

- *HIGH STARTING TORQUE*
- *LOW STARTING CURRENT*
- *HIGH OPERATING SPEED*
- *FLAT EFFICIENCY CURVE*

The Wagner Type RA is the work horse of the singlephase motor field. It combines high starting torque for quick, easy starts with low starting current and minimum light flicker. It has a constant high operating speed, even under overload, and a flat efficiency curve over a wide operating range.

You practically eliminate service problems when you power tough singlephase applications with Wagner RA Motors. They have unmatched ability to start high inertia or heavy friction loads repeatedly and they give many years of unfailing service.

Let a Wagner Sales Engineer show you how these motors can be applied to your needs. Call the nearest branch office, or write for Bulletin MU-220.

H. P.	OLD FRAME SIZE	PRESENT FRAME SIZE
1	203	182
1½	204	184
2	224	213
3	225	215
5	254	254U

Integral ratings, 1-5 hp are available in the latest NEMA Frame Sizes

4 pole (1750 RPM, 60 cycle and 1450 RPM, 50 cycle) ratings are interchangeable in mounting dimensions with capacitor start motors of the same ratings.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

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WM58-2

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

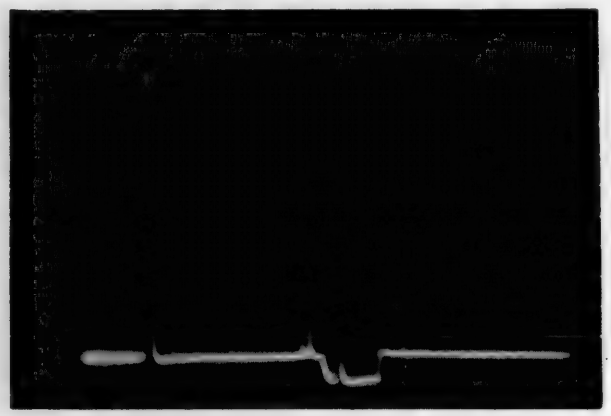
NEWS OF THE MONTH

ULTRASONIC WAVES

probe flaws in welded pressure tubing. Defects show up on oscilloscope. Check at production speeds.

Ultrasonic sound waves projected through water probe for invisible flaws in welded pressure tubing as the tubing is made by Tubular Products Div., The Babcock & Wilcox Co., New York, N. Y. The technique is said to be used for the first time as a quality control measure in the commercial production of electric resistance welded carbon steel tubing.

• **PIP BETRAYS FLAW**—In ultrasonic flaw detection, high frequency sound is beamed into the metal under test, and is echoed back by any defect in the material. Ultimately the defect shows up as a pip on an oscilloscope. Skilled operators can locate the defect precisely by referring to the point at which the sound entered the metal.



Air, however, is a poor conductor of sound. For this reason, best results are obtained by putting the ultrasound into the metal either by direct contact, or through a coupling medium such as water. The latter technique was chosen after two years of experimentation and development because it is readily adaptable to tube fabrication methods. When tests and experiments proved its effectiveness in detecting both internal and external flaws in the weld, the latest testing equipment was installed on all B&W electric resistance welding mills.

• **SPRAY GUN MARKS DEFECT**—One of the most important advantages of the system is its ability to give a continuous reading on the quality of a tube weld seconds after the weld is made by machine. When it singles out a flaw beyond a previously determined limit, a warning light goes on, a horn blows at the mill inspector's station, and a spray gun automatically marks the affected tube portion for investigation and any necessary action.

The new equipment is not being used by the company as a basis for passing or rejecting tubing, since immersed ultrasonic testing has not been developed to the point where it can absolutely indicate the size of a defect. Company officials emphasized that it is being used as an additional inspection tool to check the weld at production speeds.

Development of the technique is of special significance to the tube field because the acceptance of electric resistance welded carbon steel tubing has been dependent on the ability of producers to control its quality. Today, through rigid quality control both in materials and manufacturing, this type of tubing is accepted by boiler manufacturers, and is used at all temperatures and pressures allowed for the material by The American Society of Mechanical Engineers Boiler and Unfired Pressure Vessel Code. It is now being employed in boilers operating at 2700 psi internal pressure, and in many types of high pressure heat exchanger equipment.

NEW ASHAE OFFICERS

to be installed during 64th Annual Meeting, Pitsburgh, Pa., January 27-29. E. R. Queer is slated for top post.

Results of the election of officers of the American Society of Heating and Air-conditioning Engineers are to be reported by the Inspectors of the Election during Tuesday morning sessions, January 28, of the 64th Annual Meeting of the Society in Pittsburgh, Pa. Formal introduction and installation of the new officers takes place during the Annual Banquet, Wednesday evening.

Nominees are: president, E. R. Queer, University Park, Pa., current 1st vice-president; 1st vice-president, A. J. Hess, Los Angeles, Calif., now 2nd vice-president; 2nd vice-president, Walter A. Grant, Syracuse, N. Y.; and treasurer, J. H. Fox, Toronto, Canada. Mr. Grant is now serving on the Society Council and Mr. Fox recently completed a 3-year term on the Council.

BOARD OF DIRECTORS

of Consulting Engineers Council holds two-day meeting at Springfield, Ill. Membership is increased.

Important business of interest and value to the Consulting Engineers Council was transacted during a two-day meeting of the Board of Directors held at the Abraham Lincoln Hotel, Springfield, Ill., November 15 and 16.

• **ACTIONS TAKEN**—The Iowa Association of Consulting Engineers was accepted as members. Formal recognition was accorded the New York State Association.

The possibility of becoming members of the Engineers Joint Council and also the International Federation of Consulting Engineers was tabled for later action.

Proposed amendments to the constitution and bylaws were approved.

The council approved a contract with Calhoun and Associates to provide technical advice on a TV series featuring engineers.

A rather comprehensive survey is being made among

(Continued on page 104)

GENERAL ELECTRIC TAKES A GIANT STEP

Simplifies Air Conditioning for Big Projects ... with New G-E Factory-Assembled Central Station Units ... Water-Cooled and Air-Cooled

New General Electric 30-Ton Unit. Note smooth lines—no outside fan motors, filters, controls or other protruding parts. This unit is up to 2000 lbs. lighter than competitive 30-ton units. Features two G-E hermetic compressors.

Installation after installation has proved convincingly that large projects can be air conditioned *more efficiently*, at *less cost* with General Electric Factory-Assembled Central Station Units—*now available in 20, 25 and 30-ton capacities.*

Efficiency and low cost are only the beginning. Planning is greatly simplified—minimum need for fittings and piping—no elaborate equipment rooms—more free floor space. Air-cooled units (up to full 20 tons) eliminate cooling towers, water lines. Hermetic compressors minimize service problems. Installation in existing buildings requires no major alteration to premises, no serious interruption to business—and you get all the advantages of real Zone-by-Zone air conditioning.

Why not prove to yourself that it makes more sense to use General Electric Factory-Assembled Central Station Units for the big jobs. For complete data and specifications on all General Electric Commercial and Industrial Air Conditioners, write to: Mr. E. R. Pierce, General Electric Co., Commercial and Industrial Air Conditioning Dept., 5 Lawrence St., Bloomfield, N. J.

Progress Is Our Most Important Product

GENERAL ELECTRIC

In Canada: Canadian General Electric Co., Ltd., Montreal

the members to collect information on fee negotiations with the Federal Housing Authority, General Services Administration, and the Federal Aid Highway program.

Steps will be taken to have the council incorporated as a non-profit scientific and educational organization.

• **MEETING AND OFFICERS**—The annual meeting of the council is scheduled for San Francisco, Calif., in May, 1958.

The officers are Edward J. Wolff, president; C. C. Pate, first vice president; George W. Poulsen, Jr., second vice president; L. K. Crawford, secretary; B. M. Dornblatt, treasurer; Larry Spiller, executive secretary.

BUILDING RESEARCH PROGRAM

aims to create complete building science to enable architects and engineers to design better buildings.

A comprehensive program to stimulate and correlate basic building research on a national level will be undertaken by the Building Research Advisory Board (BRAB) and the Building Research Institute (BRI), it was announced by William H. Scheick, executive director of the two organizations.

The object is to create a complete building science that will lead to better design, better construction, better materials, and a high standard of economic efficiency for the construction boom forecasted for the 1960s. A complete building science will enable architects and engineers to design more satisfactory and economical buildings, builders to plan their operations for the greatest speed and efficiency, and give manufacturers new material to draw upon for the research and development of new building materials.

• **BRI COMMITTEE MEETS**—The program is now in the planning stage. The first step is to identify and classify basic research problems not now covered by industrial research on building materials and equipment. A BRI committee, appointed by President Charles H. Topping of E. I. du Pont de Nemours Company, with Leonard G. Haeger, vice-president and technical director of Levitt and Sons, as chairman, met in Washington, D. C., November 22 to outline the approach to this program. Tentatively called The President's Committee for the Coordination of Research, the committee will investigate the types of laboratories available to perform research work, methods of financing, management of the program, and documentation.

• **BRAB TO CHART COURSE**—Meanwhile, BRAB has scheduled a meeting in Washington on February 11 and 12, 1958, to identify building industry problems and advise on a course of action to better coordinate basic research in building science. The BRAB meeting will be limited to present and past members. Invitations to this meeting include questionnaires seeking opinions on basic research in the fields of the natural sciences, human requirements, urban planning, building design, structures, building materials, systems and components, construction, construction labor, management and operation, building costs, economics, finance and law. The BRI Board of Governors, which meets at this time, will be invited to sit in on the BRAB meeting and it is expected that a preliminary report of the BRI committee will be presented.

• **WHO'S WHO**—Both BRAB and BRI are units of the Division of Engineering and Industrial Research of the National Academy of Sciences — National Research Council. BRI is a technical society for the building industry. Its more than 360 members — architects and engineers, builders and contractors, manufacturers, and associations and societies — have appointed over 1200 representatives to BRI. BRI is a forum for research, stimulates and coordinates research, publishes research results, and assists in putting research results into practical use. It does not itself engage in research work.

BRAB is a 30-man appointive body whose members are among the foremost experts in the country. BRAB advises industry and government upon request on subjects in the field of building and construction technology. Currently, it is performing advisory services for the Federal Housing Administration and the Federal Construction Council.

The National Academy of Sciences—National Research Council is a private, non-profit corporation chartered by Congress. One of its broad purposes is to promote the effective use of the scientific and technical resources of the nation.

EUROPEAN KNOW-HOW

imported for the benefit of American enterprises by team of technologists who scout the Continent.

Twenty American firms are beginning to reap benefits from European research and development techniques in a unique program conducted by Armour Research Foundation of Illinois Institute of Technology, Chicago.

Under the program, a team of five ARF technologists are headquartered in The Hague, Netherlands, to study European technological developments of potential value in the American markets.

Since the program's inception in July 1956, a wealth of information on new products, processes, and research trends has been channeled back to the group of 20 non-competing American firms sponsoring the program.

The companies are divided into groups of four in each of five fields: mechanical engineering, electrical engineering, chemistry, chemical engineering, and metallurgy.

An observer of appropriate technical background is assigned prime responsibility for serving the four sponsoring companies in each of the technical fields. If, during the course of his travels, an observer runs across items of interest to sponsors in the other categories, this information is channeled back through one or more of the other observers.

• **RESULTS**—As a result of the team's efforts, the program to date has:

Led to the placing of several American firms in contact with their European counterparts to negotiate an exchange of product lines. One American company already

(Continued on page 106)

"A skyscraper must be every inch a proud and soaring thing, rising in sheer exultation." • Louis Sullivan

MURCHISON TOWER

new home of the
First National
Bank of Denver

This bold imposing landmark on the Denver sky line is the city's tallest and largest office building. It rises 26 stories above Denver's mile high elevation and has 586,000 sq. ft. of floor space.

POWERS

QUALITY SYSTEM OF AIR CONDITIONING CONTROL will regulate the modern high velocity year 'round air conditioning in this prestige building. Occupants of each space can dial the temperature they like and enjoy utmost comfort.

Powers Graph-O-Matic Control Center will give visual supervision of the heating and air conditioning system.

Simplicity and dependable performance of a Powers pneumatic control system enables it to provide utmost comfort with a minimum of maintenance.

To get the biggest return on the investment in air conditioning ask your architect or engineer to include a Powers Quality system of control. For further information write The Powers Regulator Co., Skokie, Ill. Offices in Chief Cities.

Located in the heart of Denver's financial district.

Roof is designed as a heliport.

Parking wing provides space for 450 cars.

Once set, a Powers pneumatic thermostat holds temperature constant day after day. It needs no frequent checking or readjustment.

POWERS CONTROL

Mark of Quality Control

Architect: RAYMOND HARRY ERVIN • Mechanical Engineers: MARSHALL & JOHNSON ALL OF DENVER, COLORADO

Builders: MEAD & MOUNT CONSTRUCTION CO. • Mechanical Contractor: NATKIN & CO.

THE POWERS REGULATOR COMPANY • 65 Years of Automatic Temperature and Humidity Control

is preparing to tool a European product in this country;

Initiated negotiations between an American producer of mechanical devices and a European electronic devices manufacturer for an exchange of engineering information that will enable both firms to have a complete product line; and

Arranged for an exchange of research information in the chemical category whereby the American company may finance some of the European firm's research costs in exchange for first rights to utilize any products that may result from the research.

• **ASSEMBLE RESEARCH DATA**— Some of the participating companies are interested only in advance technological information that may set a trend. For these companies observers attend scientific meetings and conferences on the Continent and talk to persons conducting basic research in the fields involved. The observers also establish contacts with European firms that enable American companies to obtain first rights to new products being marketed or developed in Europe. Scientific and technical literature is reviewed for all participating companies to keep them informed of developments long in advance of the appearance of this data in U.S. technical publications. Other sponsoring companies are joining the program. A cement firm has been contracted in the new ceramics and building materials category, the first of four companies which will be accepted. An additional four companies are being sought in the mechanical industries.

AUTO EXHAUST

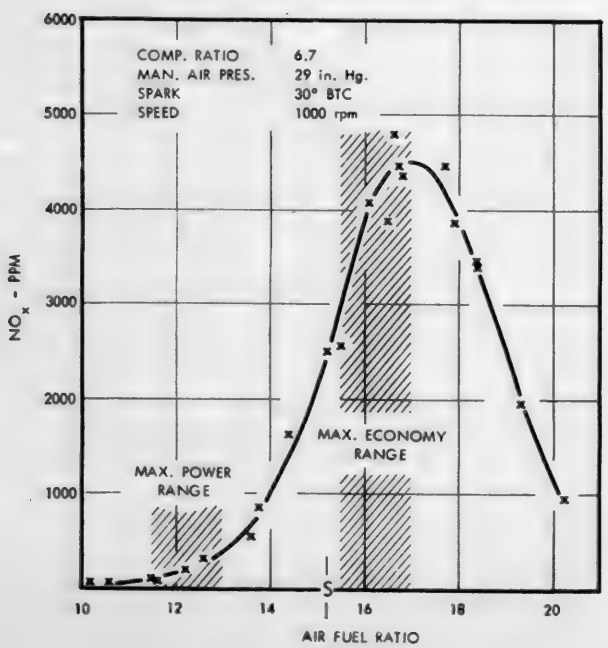
may be significantly reduced in its noxious nitrogen oxide content by application of new carburetion data.

In response to the urgings of air pollution control authorities that some sort of control method or device be developed that would materially reduce the oxides of nitrogen found in automobile exhaust gases, research has been conducted by General Motors Corporation leading to the concept of a "maximum performance carburetor." A report on its findings was presented at the 22nd Annual Meeting of the Industrial Hygiene Foundation in Pittsburgh, Pa., October 30 and 31.

A significant reduction of oxides of nitrogen can be achieved by modifying carburetion, Ralph W. Bishop and George J. Nebel, of G-M's Research Staff, say. The accompanying graph plots the effect of air-fuel ratio on oxides of nitrogen based on tests with a single cylinder engine. Superimposed on the graph are bands indicating air-fuel ratio for maximum power and air-fuel ratio for maximum economy. Maximum concentrations of the oxides were found to be always 1 to 3 ratios leaner than *S*, indicated at the base of the graph, which is the chemically correct or stoichiometric mixture. The maximum performance carburetor would provide a rich (near maximum power) air-fuel mixture at all driving conditions.

"Marked reduction (in oxides of nitrogen in the exhaust gases) must be paid for by a sacrifice in fuel economy," Messrs. Bishop and Nebel advise. "Tests showed that a 90% reduction in oxides of nitrogen would cost the individual car owner about $70 a year. However, if a smaller reduction is acceptable, the cost will be somewhat less. For example, a 75% reduction is estimated to cost the car owner only $40 a year. These figures serve as a convenient yardstick against which to compare any other method of reduction. . . .

"One of the most promising approaches to hydrocarbon control appears to be catalytic oxidation. The principle of catalytic oxidation combined with maximum performance carburetion would provide a method of eliminating from automobile exhaust gases the most objectionable constituents; namely, carbon monoxide, hydrocarbons, and oxides of nitrogen."



THE HEAT PUMP

stole the Air Conditioning and Refrigeration Show which had the biggest turnout in its history.

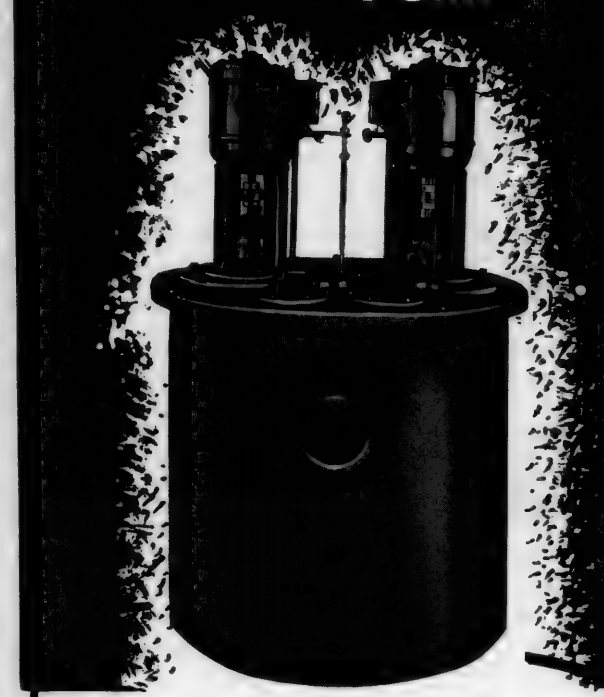
With the largest display in its history, the 10th Exposition of the Air-Conditioning and Refrigeration Industry ended a four-day run at Chicago's International Amphitheatre, November 21, after drawing a record-breaking attendance of 14,752. Visitors came from Australia, Belgium, Brazil, British West Indies, Colombia, Cuba, Denmark, England, Finland, France, Germany, Hawaiian Islands, Italy, Japan, Lebanon, Mexico, Netherlands, Philippines, Puerto Rico, South Africa, Spain, Sweden, and the Union of Soviet Socialist Republics.

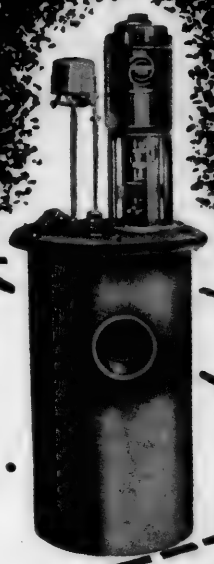
Highlights included the showing by many companies of production models of the heat pump, a fact which indicated that this efficient equipment for all-year heating and cooling is finding a market for itself.

Sleeker, thinner room air conditioners, a wide variety of color for cabinets in the commercial refrigeration field, combination central heating and cooling systems, portable room air conditioners and remote units for air conditioning systems were among the newer items which attracted visitor attention.

Skidmore

PUMP CUSTOM DESIGN





single unit

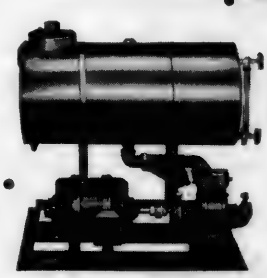
"UV" CONDENSATE PUMP

Compact, vertical type pump . . . consists of motor unit and float switch mechanism bolted to sump type receiver. Designed for below floor level return.

Capacities—2,000 to 40,000 EDR.
Pressures—10 to 75 lbs.

SEND FOR BULLETIN No. 19-A

TYPE "CVS" CONDENSATE
Capacities — 500 to 10,000 EDR. Pressures—10 to 40 lbs.



TYPE "TM" TURBINE. Capacities—boilers up to 250 H.P. Pressures up to 150 lbs.

There's a Skidmore Pump built for every heating requirement.

SKIDMORE PUMPS

SKIDMORE CORPORATION
ST. JOSEPH, MICH.

Five important reasons why

Power Line

best solves your industrial ventilation problems:

1. Complete line: Broadest product line of air-moving equipment for every industrial requirement.

2. Certified performance: All Power Line Fans are rated by PFMA and by NAFM.

3. Backed by 33 years of specialization in manufacture of highest quality ventilation equipment.

4. Competitively priced to give you important cost savings in initial investment and in maintenance. You get the precisely right product to fit your requirements. You don't over-buy with equipment too large or under-buy with equipment too small.

5. Sold only through qualified ventilation specialists. You get expert technical advice and service from the survey of your requirements right through to the completion of your installation.

YOURS ON REQUEST: Big 20-page Power Line Catalog gives complete facts about industrial ventilation, including selection of proper type and size of fan, calculation of duct resistance, and installation procedures, plus features, dimensions, specifications and performance data. Without obligation write for your free copy of Catalog No. 99.

POWER LINE FAN COMPANY, INC.

Subsidiary of **Chelsea Products, Incorporated** 639 South Avenue, Plainfield, New Jersey

NEW CATALOGS

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

PLUMBING, DRAINAGE PRODUCTS—Plumbing and drainage products are the subject of a 100-page catalog published by Blake Div., Hoffman Specialty Manufacturing Corp., Indianapolis, Ind. Illustrated and described in detail are floor, shower, swimming pool, and roof drains; closet fittings and carriers; lavatory and sink carriers; manhole frames and covers; and wall hydrants. Installation diagrams are included in this catalog, designated No. B-154.

Circle **Item 54** on Inquiry Card

FLAME-CUTTING NOZZLES—The story behind the manufacture of Oxweld flame-cutting nozzles is told in a new 12-page folder prepared by Linde Company, Division of Union Carbide Corp., New York, N. Y. The folder describes and illustrates some of the many production steps that go into the manufacture of the cutting nozzles, and also tells how precision workmanship at the factory assures dependable performance and efficient operation on the job.

Circle **Item 55** on Inquiry Card

PORTABLE WELDING KIT—For homehandymen, contractors, and manufacturers is the Selfweld kit, described in a 4-page bulletin from The Lincoln Electric Co., Cleveland, Ohio. Kit includes Lincwelder 100 portable unit, Selfweld electrodes, handshield with lens, and all other required components for quality welds, cutting, soldering, brazing, and heating.

Circle **Item 56** on Inquiry Card

HIGH-SPEED SYNCHRONOUS MOTORS—Features and applications of the company's large high-speed synchronous motors, and the services that go with them, are described in an eight-page bulletin, GEA-6620, available from General Electric Co., Schenectady, N. Y. Large cutaway drawings give an X-ray view of the horizontal and vertical motors of 1500 hp and up.

Circle **Item 57** on Inquiry Card

AIR, STEAM CLEANERS — A 4-page folder, Bulletin 502, describes filter-free, maintenance-free air cleaners and steam cleaners manufactured by The V. D. Anderson Co., Cleveland, Ohio. A description and cutaway drawing show how these cleaners operate without the use of moving parts, filters or baffles. This prevents clogging and loss of pressure, and eliminates any maintenance problems.

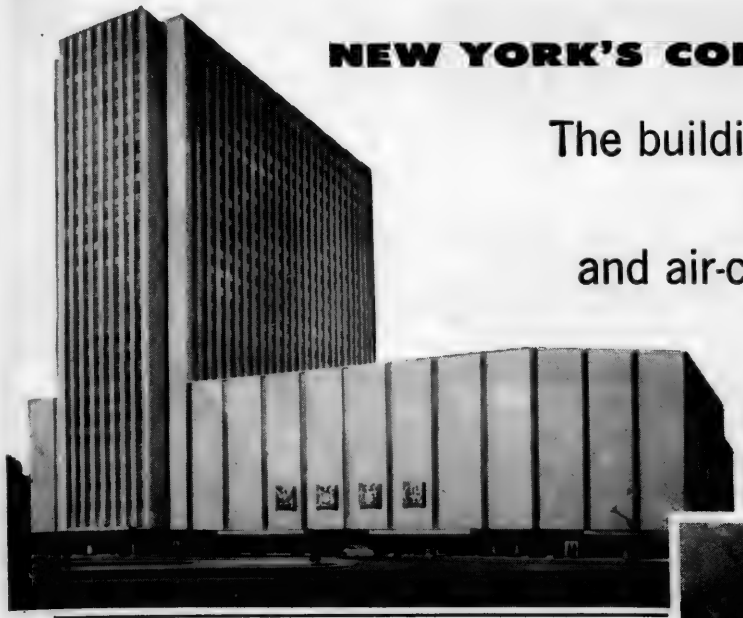
Circle **Item 58** on Inquiry Card

(Continued on page 110)

NEW YORK'S COLISEUM—

The building that "has everything"
has heating
and air-conditioning systems of

NATIONAL PIPE



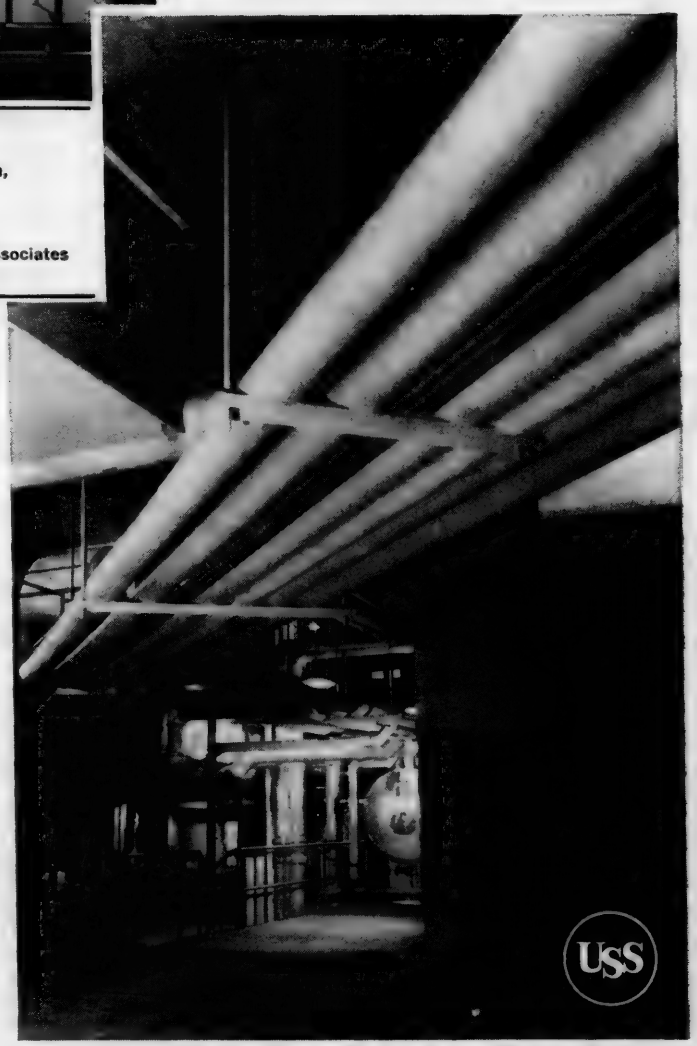
OWNER: Triborough Bridge & Tunnel Authority
ARCHITECTS: Leon & Lionel Levy
CONSULTING ARCHITECTS: Eggers & Higgins, John B. Peterkin, Aymar Embury III
GENERAL CONTRACTOR: Walsh-Fuller-Slattery
HEATING & AIR CONDITIONING: Almirall & Company, Inc.
MECHANICAL & ELECTRICAL ENGINEERS: Guy B. Panero Associates
STRUCTURAL ENGINEER: Dr. Jacob Feld

New York City's Coliseum is one of the most distinctive and functional structures ever conceived. Its 26 floors and giant exhibition hall comprise an auditorium area capable of seating over 10,000 persons, approximately 1,000,000 sq. ft. of usable floor space, and an 850-car underground garage. Except for the garage, the building is completely air conditioned.

More than 376 tons of National Pipe were used in the heating and air-conditioning systems of the new structure. The office building area requires 1,500 tons of refrigeration; the Coliseum proper requires 2,500 tons. Four compressors supply 4,000 tons of refrigeration for the high-pressure air-conditioning system.

Purchased steam is delivered at 125 to 150 psi. Pressure-reducing rigs reduce it to 50 psi and 5 psi for distribution throughout the buildings. Steam requirements are about 102,000 lbs. per hour for comfort heating and auxiliary uses.

Possessing a solid reputation for dependable service, USS National Pipe is the choice of engineers and contractors throughout the country for air-conditioning, heating and power installations. It is synonymous with efficient, satisfactory service under all types of pressure and temperature conditions. For more complete information, get in touch with us. For technical assistance, our engineering staff is at your service.



NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

NATIONAL PIPE

UNITED STATES STEEL

to FIT the JOB*

the BRYAN* Copper Tube BOILER

For every steam or water heating application up to 1,800,000 B.T.U. output.

Whether the plans on your boards are for a factory, apartment house, swimming pool or a modest radiant heat home, a detailed check on specifications will point to one of the many Bryan models covering low or high pressure steam, hot water boilers, or indirect water heaters.

The Bryan is a heavy duty, durable boiler made to deliver a lot of B.T.U's in a short period of time. Specially engineered for gas or oil heating, its high efficiency is complemented by years of trouble free service. Requires minimum floor space.

Bryan is the originator of the famous Bryan copper tubes. They are used in both direct and indirect heating units for fast action and elimination of scale deposits.

Bryan Gas Fired Boilers are designed and built to the requirements of the A.S.M.E. code and are also approved by the American Gas Association (A.G.A.)

Send For Technical Information • 2100 Chili Pike

BRYAN STEAM CORPORATION • Peru, Indiana

NEW CATALOGS

(Continued from page 108)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

UNIT HEATER MAINTENANCE — Four pages of valuable tips on what to do and what not to do in installing and caring for unit heating equipment are given in illustrated Bulletin No. 12, Care and Maintenance of Steam and Hot Water Unit Heaters, published by Air Moving and Conditioning Association, Detroit, Mich. Pointers on installation include such topics as low pressure gravity systems, vacuum systems, high pressure systems, branches from steam supply mains, and strainers. Recommended maintenance procedures cover motors, heating elements, fans, casings, traps and check valves, and special considerations for forced water and blower type unit heaters. Included is a discussion of system corrosion—its causes and how to prevent it.

Circle **Item 59** on Inquiry Card

SUBMERSIBLE PUMPS — Commander Division of The Tait Manufacturing Co., Dayton, Ohio, has produced a new catalog, No. 958, showing a complete line of 2-wire and 3-wire submersible pumps and water systems. Eleven models of the 2-wire Commander submersibles meet the needs of all domestic wells, 4 inches (or larger) with depths from 0 to 360 ft. Motor sizes range from ¼ through 1 hp. The 3-wire models (for both 4- and 6-inch wells) reach to 500 ft, and motor sizes range from ½ through 3 hp.

Circle **Item 60** on Inquiry Card

CAST STEEL GATE VALVES—A cast steel gate valve bulletin is announced by Walworth Co., New York, N. Y., describing its 150-lb and 300-lb valves. Their properties are described. Dimension and weight charts are included. A large cutaway shows how stem scoring is prevented through sufficient clearance for the one-piece gland between the gland, stem, and stuffing box.

Circle **Item 61** on Inquiry Card

AIRFOIL CENTRIFUGAL FANS—A catalog entitled Airfoil Centrifugal Fans is available from Sturtevant Div., Westinghouse Electric Corp., Boston, Mass. This catalog, No. 1121, describes the efficiency and quietness of airfoil blading for all-purpose applications in a line of centrifugal fans (Series 8000) covering requirements up to 700,000 cfm and 16¾ inches total pressure. Selection charts are included for quick and accurate specifying. Block dimensions and fan arrangements are also detailed.

Circle **Item 62** on Inquiry Card

(Continued on page 112)

SAVE TIME and MONEY

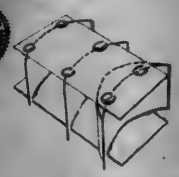
when you form

FLEXIBLE CONNECTORS

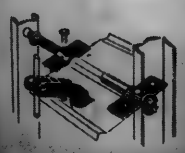
ELGEN SILENT DUCT

Imagine, this one-piece, factory-assembled metal-to-material unit unrolls absolutely *flat!* No more bothering with unwieldy duct material that buckles easily. Elgen Silent Duct makes on-the-spot work a cinch . . . you just measure and cut. You can fabricate *any type* of flexible duct connector in minutes . . . with half the effort! You can save up to 60%! No more worry about an inventory of "made-up" parts, either. Your choice of U.L. approved, (Gov't. Spec. Mil-D-10860) canvas, Johns-Manville asbestos and U. S. Rubber neoprene coated fibre glass, in 3" or 6" widths attached to 24 or 26 gauge galvanized steel or 24 gauge aluminum to fill every job requirement. All available in handy-to-use 25, 50 or 100 foot rolls.

2 More Elgen Products That Put Profits In Your Pocket!



ELGEN ALL-TITE VANE RUNNER
• Quickest and easiest way ever devised for installing turning vanes for square elbows • No special tools required; vanes lock easily with blow of hammer



ELGEN DAMPERSET
For Multi-Blade Dampers, Parallel or Opposed • Most perfect damper hardware developed • Assembles in a jiffy . . . cuts assembly time in half • Easily adjusted and self-aligning. Licensed by Minneapolis-Honeywell

ELGEN PRODUCTS ARE SOLD THROUGH LEADING JOBBERS EVERYWHERE.

"Put Profits In Your Pocket!"

Write today for free catalog and "spec" sheet!

ELGEN MANUFACTURING CORP. 41-34 39 Street Long Island City, N. Y.

MEASURE

ACTUAL AIR DELIVERY

with

Alnor®

VELOMETER

A simple, direct reading on the Alnor Velometer gives you instant measurement of actual air delivery in any distribution system. This fast, precise method eliminates the time and money wasted in trial-and-error balancing...the profit-eating call-backs so often necessary with other less precise measurements.

The Velometer is the only instantaneous, direct reading air velocity meter—accurate in all ranges, from high to low... compact, portable, easy to understand and use. Wide assortment of jets and fittings makes this precision instrument ideally suited for all air velocity measurement.

First Choice of Industry

Take the recommendation of every major manufacturer of air diffusers and leading contractors—get an Alnor Velometer. You'll save time and money on the next installation you balance.

Alnor **PRECISION INSTRUMENTS FOR EVERY INDUSTRY**

Illinois Testing Laboratories, Inc.
Room 514, 420 No. LaSalle St.
Chicago 10, Ill.

Please send Velometer Bulletin 2448-G.

Name.....

Company.....

Address.....

City.....Zone.....State.....

DARTS ARE THRIFTY ON THE POCKETBOOK

. . . TIGHT ON THE LINE!

Yes sir, Dart Unions cut costs because

1. They last longer — their two bronze seats are precision ground to a true ball joint.
2. They're easy and fast to install.
3. They *stay* tight — damage no property, spoil no work.
4. They can be used over and over again.

Which is why the answer to "How thrifty, how tight *can you get* is . . . GET DARTS"!

QUICK FACTS

- Leakproof because precision-machined to a true ball joint and spherically ground
- Shoulders are heavy — can take abuse
- Each Dart is individually vacuum-tested
- Bronze alloy seats are extra wide, resist pitting and corrosion
- Practically indestructible nut and body — of air-refined, high-test malleable iron

DART UNIONS *Products of* **DART UNION COMPANY** PROVIDENCE 5, R.I.

GENERAL SALES AGENT

THE **Fairbanks** COMPANY
393 LAFAYETTE STREET, NEW YORK 3, NEW YORK
BRANCHES: NEW YORK 3
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AVAILABLE THROUGH YOUR LOCAL DISTRIBUTOR

NEW CATALOGS

(Continued from page 110)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

VIBRATION CONTROL MOUNTINGS—A catalog giving engineering specifications and performance data for its line of machinery mountings is available from The Korfund Company, Inc., Long Island City, N. Y. Bulletin K4D presents fifteen different types of machinery mountings which utilize steel springs, rubber, and cork —either singly or in combination to provide the highest attainable isolation efficiency—and shows actual installation photos of a variety of equipment, illustrating the application of these isolation units.

Circle **Item 63** on Inquiry Card

ALL-PLASTIC GATE VALVE—A four-page booklet containing essential and usable data about its Flex-Plug all-plastic gate valve has been prepared by Vanton Pump & Equipment Corp., Hillside, N. J., for those who have problems conveying corrosive and abrasive liquids in lines that must be chemically free of contamination. Details about the valve include simplified drawings showing the advantages of the straight-through, no-pressure-drop flow, and the close throttling control designed into the valve.

Circle **Item 64** on Inquiry Card

RESIDENTIAL BASEBOARD RADIATION —Benefits of baseboard heating in the home are graphically presented in a bulletin by National-U.S. Radiator Corp., Johnstown, Pa. For builders and contractors, this bulletin can serve as effective sales literature for the company's new Art Comfortline baseboard—the improved competitive line recently announced in the trade. While this new bulletin is primarily directed toward the homeowner, it also contains the necessary dimensional and performance data needed by the heating engineer.

Circle **Item 65** on Inquiry Card

PERIMETER AIR CONDITIONING — A 16-page, 2-color bulletin, No. 8827, describing the company's line of Inductor air conditioners for perimeter air conditioning of multi-storied buildings is now available from American Blower Division of American-Standard, Detroit, Mich. The catalog outlines and illustrates the features and characteristics of the units, and a special section is devoted to unit selection. This section includes a table of basic unit ratings, primary air rating curves, heating and cooling capacity indices, gravity heating capacities, coil water friction valves, pressure drop curves, and curves for orifice size selection.

Circle **Item 66** on Inquiry Card

LEAD FOR FLASHINGS, PLUMBING — Lead Industries Association, New York, N. Y., has just published two 4-page leaflets on the application of new hard lead sheet for roofing and flashing and the use of lead in today's plumbing systems. The leaflets, Modern Sheet Lead for Roofing and Flashing, reports on the preferred installation methods for the new 2½-lb and 3-lb hard lead, both designations being indicative of the weight of lead per square foot. Detailed drawings of flashings for open valleys, stepped sidewalls, chimney caps, cornice, coping and through-wall flashings, and for built-in gutters, are included, as well as lead roof constructions details. The leaflet, Lead for Modern Plumbing, describes the preferred installation methods for lead pipe and fittings in the plumbing systems of today's office buildings, other commercial structures, hospitals and small homes.

Circle **Item 67** on Inquiry Card

INDUSTRIAL HEATER UNIT—A 26-page product bulletin, describing the construction, application, and performance features of the Herman Nelson industrial heater, is released by American Air Filter Co., Inc., Louisville, Ky. Bulletin No. 750A explains operation of the heating and ventilating unit that is designed to meet industrial requirements, whether for make-up air or for plant heat load. Thirteen performance graphs and charts pertaining to steam capacities, air flow resistance, and other air flow data are included.

Circle **Item 68** on Inquiry Card

REGISTERS AND GRILLES—Registers, grilles, air diffusers, intakes, and returns are described and illustrated in an 8-page catalog published by Standard Stamping & Perforating Co., Chicago, Ill. Featured is the company's Modulaire series of registers, made in all standard duct sizes, and in bar and damper combinations suitable for every size and type of conditioned space.

Circle **Item 69** on Inquiry Card

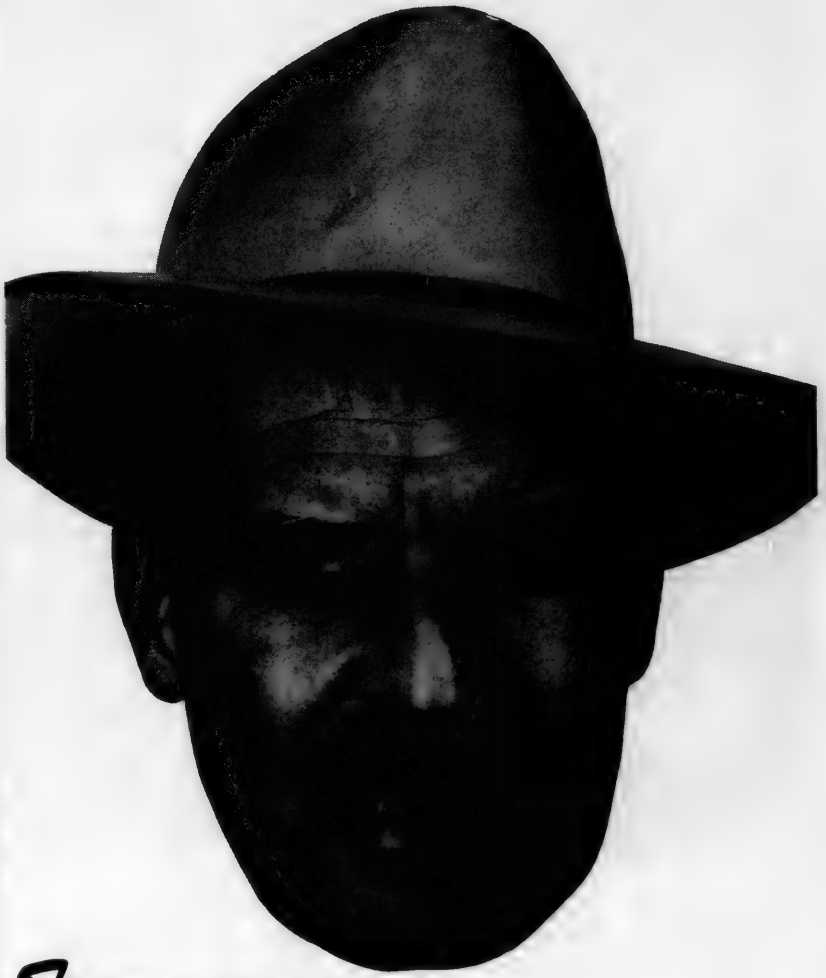
STEEL SAFETY SCAFFOLDS—A 4-page folder from Baker-Roos, Inc., Indianapolis, Ind., describes features and adaptability of steel safety scaffolds for all off-the-floor work. These scaffolds are highly maneuverable, can be easily built up to reach high places, and provide a safe, sturdy platform which will support several men working at the same height or different levels. Units are equipped with 3, 5 or 8-inch casters, with or without brakes, and store flat.

Circle **Item 70** on Inquiry Card

TURBINE VENTILATOR — A catalog sheet on Series RT Rotoflo turbine ventilator manufactured by Greenheck Fan & Ventilator Corp., Schofield, Wis., shows capacities and dimensions with cutaway drawing of construction.

Circle **Item 71** on Inquiry Card

(Continued on page 114)



From now on...

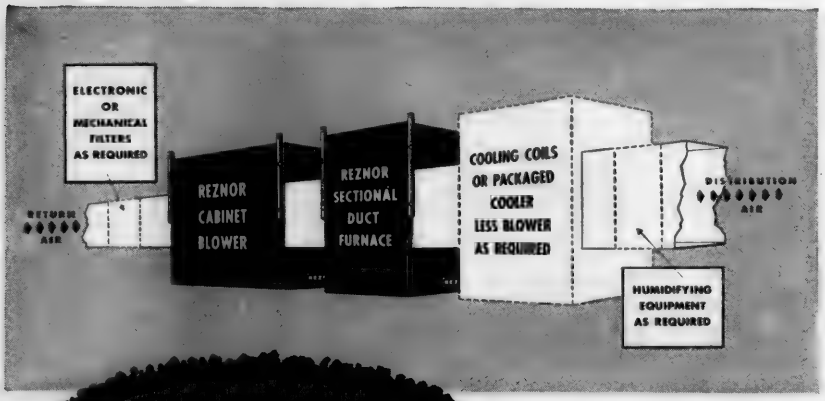
I'm going to install dependable DEMING WATER SYSTEMS!

Successful contractors build their reputation through customer satisfaction by specifying and installing *economical, trouble-free* DEMING PUMPS.

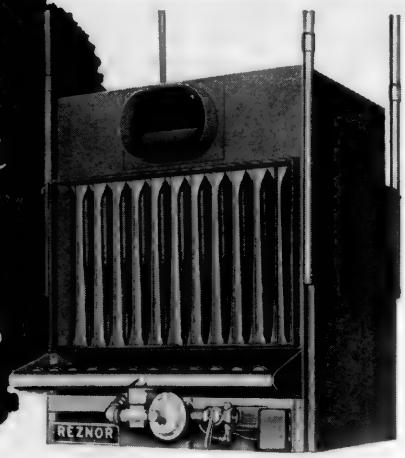
Write for FREE catalog and names of your local Deming Distributors

The DEMING Company

558 BROADWAY • SALEM, OHIO


ELECTRONIC OR MECHANICAL FILTERS AS REQUIRED
RETURN AIR
REZNOR CABINET BLOWER
REZNOR SECTIONAL DUCT FURNACE
COOLING COILS OR PACKAGED COOLER LESS BLOWER AS REQUIRED
DISTRIBUTION AIR
HUMIDIFYING EQUIPMENT AS REQUIRED

How to Match a Heating System to Exact Job Requirements



Reznor sectional duct furnaces free the designer from the limitations imposed by packaged heating equipment . . . equipment which can't be *exactly right* for any one job because it has to be *good enough* for so many different jobs.

A heating or heating-cooling system designed around a Reznor duct furnace can be matched to exact job requirements. Each duct furnace is a compact, highly efficient heat exchanger with a full set of operating controls. All other components,—for air moving, cooling, cleaning and moisture control—are separately specified and installer-supplied. Only those components which are necessary on the particular job need be included, with each individually selected to fit that one job.

Sectional assembly (a completely new concept in duct heating equipment) completely eliminates the installation problems which formerly prevented the use of large capacity custom-engineered duct heating systems. With the Reznor Series DS sectional duct furnace, systems with capacities in excess of 2,000,000 Btu can be assembled on the job from sections weighing no more than 315 pounds. Each of four basic sections—150, 200, 250, and 300 thousand Btu—is complete with controls and is provided with its own built-in draft diverter, flue connections and mounting pipes.

If you aren't taking advantage of the design flexibility of Reznor sectional duct furnaces, you're missing a good bet on many of your commercial, industrial and institutional jobs. Don't delay getting all the details on this versatile line of heaters. Give your nearby Reznor distributor a call—today.

REZNOR
WORLD'S LARGEST-SELLING DIRECT-FIRED UNIT HEATERS
Reznor Manufacturing Co.,
64 Union St., Mercer, Pa.

for complete details,
wherever you are . . .

NEW CATALOGS

(Continued from page 113)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

POLYVINYL CHLORIDE PIPE — A. M. Byers Company, Pittsburgh, Pa., has published a 30-page book on the company's two new lines of PVC pipe. Besides installation data, flow curves, and pressure-temperature curves, the book features an 8-page table on the corrosion resistance ratings of various pipe materials to approximately 400 fluids.

Circle **Item 72** on Inquiry Card

FASTENING SYSTEM—A 4-page bulletin from Fastway Fasteners, Inc., Lorain, Ohio, describes a proven, modern system for fastening light construction materials and equipment directly to concrete, concrete block, brick, mortar, and steel (up to ¼-inch thick). All that is required is the compact Ham-R-Tool, versatile stud pins in 11 styles, and a 2½-lb sledge hammer.

Circle **Item 73** on Inquiry Card

UNDERGROUND PIPE INSULATION—Underground hot pipe insulation is described in a 12-page folder, published by Z-Crete Div., Zonolite Company, Chicago, Ill., which contains sequence photographs and diagrammatic drawings of this cast-in-place monolithic conduit system. Features cited are efficient insulation, substantial structural pipe support, high mechanical and load bearing capabilities, and resistance to water penetration.

Circle **Item 74** on Inquiry Card

ARC WELDING INFORMATION—How to Get Better Welds, a completely revised edition of Weldors' Vest Pocket Guide containing 60 pages of useful arc welding information, is available from Hobart Brothers Co., Troy, Ohio. It includes information on metals and electrodes, 4 essentials of proper welding procedures, types of joints, typical welding positions, welding symbols, standard steel shapes available for welding, and causes and remedies of common welding troubles.

Circle **Item 75** on Inquiry Card

LIFETIME ALUMINUM FILTERS—A data sheet published by Air-Con Filter Co., Memphis, Tenn., describes the company's line of lifetime aluminum air filters as well as a deodorizing filter oil. Filters are washable and rust proof, having coarse mesh on intake grading to very fine on exhaust side. Deodorizing filter oil, pressurized in metal containers, attracts pollen and sub-microscopic dust.

Circle **Item 76** on Inquiry Card

(Continued on page 116)

another Heat-Timer quality product

LOW-COST HEAT ZONING

easy-to-install ZONVALVE®

Now — the comfort of multiple-zone heating at a fraction of the former cost. ZONVALVE, new thermostatically-controlled motorized valve, replaces ordinary radiator valve *without plumbing change.* On new installations, ZONVALVES can be installed on radiators or branch lines.

Easily installed. Made in all standard pipe and tubing sizes. Low-voltage wiring permits placement of thermostat where most effective and convenient, with *low wiring cost.*

Opening of ZONVALVE automatically actuates burner or circulator.

ZONVALVE is designed for use on steam and hot water systems.

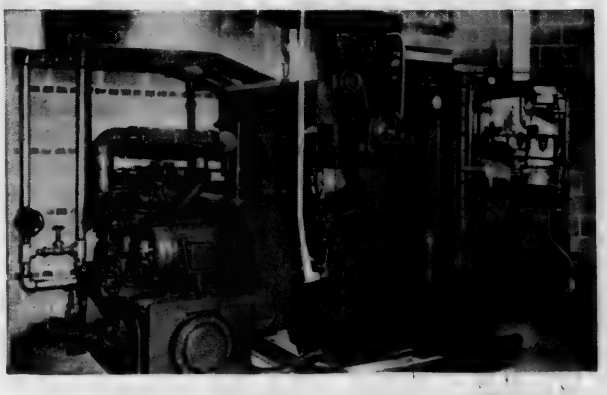
Ideal for private homes, factories, office buildings, hotels and motels.

HEAT-TIMER CORPORATION D-1
657 BROADWAY • NEW YORK 12, N. Y.

Please send me full details on ZONVALVE.

Name..... ☐ Jobber ☐ Contractor-dealer
Address.....
City.....Zone.....State.....

DRY AIR...
PRECISELY as you want it



NIAGARA CONTROLLED HUMIDITY AIR CONDITIONING

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

Write for full information; ask for Bulletins 112 and 121. Address Dept. HV-1.

NIAGARA BLOWER COMPANY
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NEW CATALOGS

(Continued from page 114)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

STAINLESS STEEL PRODUCTS — Products of Stainless Steel for Architects and Builders, a 44-page illustrated reference manual, is published by Committee of Stainless Steel Producers, American Iron and Steel Institute, New York, N. Y. The booklet describes stainless steel components for store fronts, windows and doors, hardware, exterior wall, swimming pool appointments, and heating systems. In addition the booklet includes a 3½-page listing of stainless steel component manufacturers, listed by component type, as a source file for the architect, engineer, and builder.

Circle **Item 77** on Inquiry Card

PROTECTIVE THERMAL WELLS—Complete specifications on wells for thermostat applications in fluids, gases, or high pressure environments are included in a catalog prepared by Fenwal Incorporated, Ashland, Mass. The 2-page catalog describes copper and stainless steel designs suitable both for immersion and surface mounting. Each of the seven designs listed has complete dimensions, operating specifications, and ordering data.

Circle **Item 78** on Inquiry Card

INDUSTRIAL HEATERS—A 4-page industrial heating catalog is published by Lennox Industries, Inc., Des Moines, Iowa. Describing the company's full line of new industrial heaters, the catalog features the versatility of units ranging from 400,000 to 2,000,000 Btu per hr.

Circle **Item 79** on Inquiry Card

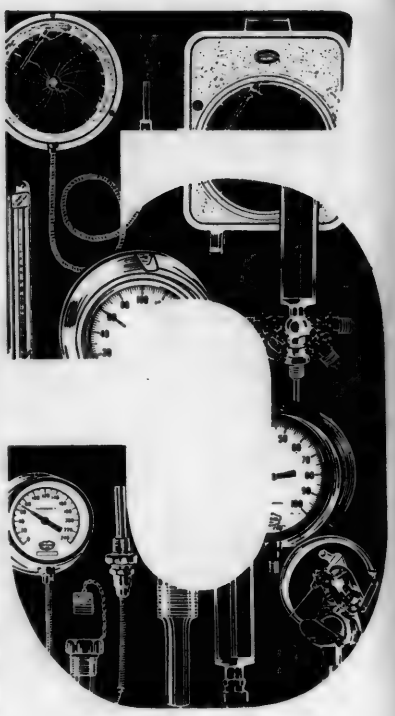
SEMI-RIGID DUCT INSULATION—An engineering application bulletin is available from Baldwin-Hill Co., Trenton, N. J., describing spun mineral wool duct insulation for application to heating and air conditioning ducts to 450 deg F. Thermal conductivities and sound absorption coefficients are tabulated. Physical, chemical, mechanical, and handling properties are described.

Circle **Item 80** on Inquiry Card

FORGED STEEL UNIONS — Clayton Mark & Company, Evanston, Ill., has published a brochure entitled What Makes a Good Union? The 16-page, 3-color booklet contains practical tips and information on forged steel unions, and is useful also as a reference for training new men.

Circle **Item 81** on Inquiry Card

(Continued on page 118)



WEKSLER INSTRUMENT CATALOGS

Here are the answers to all your requirements for temperature, pressure and humidity indicating, recording and controlling instruments.

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Catalog 325A Dial Indicating and Recording Thermometers
Catalog 425A General Purpose Thermometers
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FREEPORT, L. I. NEW YORK

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HIGH VELOCITY AIR FILTERS

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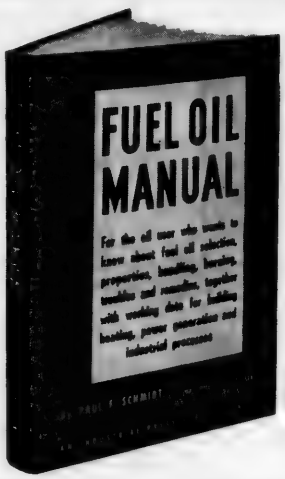
A few distributorships available.
Write for details!



Here is a book that will give you a comprehensive picture of the characteristics and uses of every type and grade of fuel oil. The author explains the meaning of each oily property, and shows how this information is applied to the selection, handling and burning of fuel oil. Impurities and how they effect combustion are described fully, and a special chapter describes fuel oil additives and how they are used. Another chapter lists troubles which may be encountered in using fuel oils, and shows the correct remedy to apply in each case. Technical language is avoided wherever possible and all terms are fully explained.

160 Pages **$3.50** 34 Tables

In Canada or overseas, $4.20

THE INDUSTRIAL PRESS
93 Worth Street New York 13, N. Y.

For Air Conditioning-Refrigerating Systems Boosey Fixed Air Gaps

Boosey air gap
Boosey fixed air gap number 2021.

Shipped ready for installation, Boosey air gaps save time, add convenience on the job. Eliminate water supply contamination by siphonage through direct connections.

Write for Boosey complete line drain catalog number B-49-C-VI.

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NO JOB WAITS FOR

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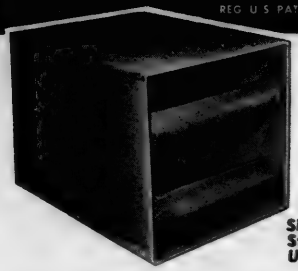


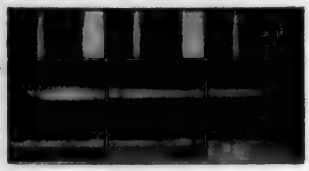
Single Unit Standard Uni-Silencer

THE NEW SILENCER FOR AIR CONDITIONING AND VENTILATING SYSTEMS!

UNI-SILENCERS* and UNI-RESONATORS* have been designed specifically to reduce the airborne noise generated by fans in industrial ventilating and air conditioning systems. Low in cost from both the original purchase and installation view, Uni-Silencers are delivered in cartons weighing about 75 lbs. each. They may be easily and inexpensively transported into the building, to the specific location required.

UNI-SILENCERS* compare favorably in cost with conventional duct lining.

When air flow, pressure drop, or noise attenuation require the use of more than one Uni-Silencer, then units (singles, halves or quarters) may be set together using built-in slip joints. Thus in series, or in parallel Uni-Silencers will fit any condition or requirement.



3 Uni-Silencer singles and 3 half units set together in a block for efficiency

UNI-SILENCERS* are supplied in 3 sizes: Full Unit—24x24x32"; Half Unit —12x24x32"; Quarter Unit—12x12x 32".

UNI-SILENCERS* are sold on a *guaranteed* basis. Interior and exterior surfaces are smooth, made of perforated and unperforated metal to reduce resistance to a minimum.

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NEW CATALOGS

(Continued from page 116)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

MOTORS AND DRIVE SYSTEMS—A 12-page booklet, Bulletin No. A-2400, discusses the specialized drives and motors engineered and built to the toughest industrial and government specifications by Reliance Electric and Engineering Co., Cleveland, Ohio. Covered are many units for shipboard application, as well as integral a-c motors to 400 hp; d-c units to 1,000 hp; d-c and a-c generators and motor-generator sets; gearmotors and variable-speed drive systems and their control.

Circle **Item 82** on Inquiry Card

PLASTIC FOAM APPLICATIONS—A 12-page, full color brochure by Brown Rubber Company, Lafayette, Ind., describes the relative merits of sponge rubber. vinyl foam, and urethane foam for use as sealing, cushioning and dampening components. As these materials appear so similar in many respects, the booklet is designed to help manufacturers determine which material to choose by pointing out important differences in performance characteristics. For example, broadly speaking, sponge rubber serves best for weather-sealing; vinyl and urethane foams for cushioning and shock absorption, company asserts.

Circle **Item 83** on Inquiry Card

HUMIDITY INSTRUMENTATION — An informative 6-page catalog describing relative humidity and temperature instrumentation is available from Serdex, Inc., Boston, Mass. Design and construction details are provided for a complete line of humidity indicators, recorders, and controllers. Accessory photographs are included.

Circle **Item 84** on Inquiry Card

HOT PROCESS SOFTENERS—A 24-page bulletin is released by Cochrane Corporation, Philadelphia, Pa., describing company's hot process softeners. Among other information contained in bulletin is a section on conditions of water that make treatment necessary. Subjects covered are reduction of silica, foaming and priming, and problems of protection against corrosion. The book concludes with a list of chemical reactions frequently referred to in feedwater treatment.

Circle **Item 85** on Inquiry Card

PLIABLE CLAMPS AND STRAPS—Pliable clamps and straps for supporting pipe, tubing, and cable are listed with dimensions in a descriptive sheet from Holub Industries, Inc., Sycamore, Ill. Materials include Saran, nylon, polyethylene, ethyl cellulose.

Circle **Item 86** on Inquiry Card

CLASSIFIED ADVERTISING

Sold at $12 per column inch.

PRINTED FORMS available for immediate shipment. Heating & oil burner materials form, burner service record cards, service order forms, inspection information form, survey sheet and others. Also can supply BURNER SERVICE form in 8 part EZE-SNAP with 2 carbons in each set. 1200 sets IMPRINTED with your name, address and telephone, only $20.40. Send for samples—no obligation. Write Dept. AC, Degree Day Systems, 39-30 58th St., Woodside 77, N. Y.

MANUFACTURER'S AGENTS

An established manufacturer with 25 years experience producing ventilating equipment is looking for manufacturers' agents in many sections of the country to sell their new line of industrial fans. The products include axial flow and tubeaxial fans, both direct and belt driven, and power roof ventilators.

Please reply Box 914, Air Conditioning, Heating & ventilating, 93 Worth St., New York 13, N. Y.

ESTABLISHED HEATING AND COOLING REGISTER and grille line. Manufacturer wishes to contact agents in open territories. State present lines covered and general qualifications. Write Box 916, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

PLUMBING-Heating Contractor: commercial, government, industrial jobs, 1956 sales $857,497, central Ohio, owner retiring.

PLUMBING-Heating, 1956 sales-service $52,385, new homes-commercial work, 3 trucks, north central Ohio.

HEATING Company, furnace installations, roofing, spouting, 1956 sales $47,000, N.E. Ohio, price $30,000 includes 9-room house. APPLE Co., 1836 Euclid, Cleveland, O.

WANTED

Sales engineer, experienced selling heating & air handling equipment to jobbers and large contractors; car necessary, Draw vs. commissions. Send qualifications. Box 915, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

FOR SALE
6—#40F-3 Swartwout Airlift Centrifugal Roof Fans

10,030 C.F.M.—Aluminum
1 H.P., 3 phase, 60 cycle, 550 volt motors
Material new in original shipping crates
Cost new—$705.00 each
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AIR CONDITIONING & SERV. N. TENN. Price $25,000 incl inv. fixt. & del. eqpmt. Gross Sales p/yr $194,687 Xlnt oppty, Free & clear. Ref. B-9463.

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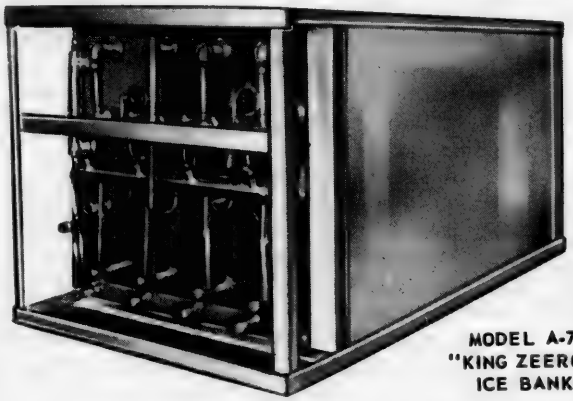
Add a "King Zeero" ICE BANK to Your Refrigerating System for Effectual, Economical Air Conditioning

The "King Zeero" ICE BANK is designed to deliver 32° to 34°F. ice water for recirculation through air cooling coils in exactly the right amount when and where it is needed. It levels off "peak" and "valley" loads. Peak loads many times compressor capacity are easily handled. Ice Banks may be added to increase existing capacity. Refrigerant: Freon, Methyl Chloride or Ammonia.



MODEL A-7
"KING ZEERO"
ICE BANK

CAPACITIES - 500 lbs. to 30,000 lbs. (72,000 B.T.U.'s to 4,320,000 B.T.U.'s) in a single unit. Multiple units may be installed.

The Patented Coils with Built-in Louvres opposed to the flow of water through the ICE BANK provide turbulence. This eliminates a mechanical agitator - insures all the water rubbing all of the ice. No upkeep or repair expense whatever.

The "King Zeero" Ice Storage System of water chilling has definite advantages over direct expansion, or other types of ice accumulators.

Saves power through smaller compressor requirement. Simple construction (no moving parts). Dependable in performance. Low operating and costs.

Let the ice stored during light loads take care of peak loads. The compressor need only handle the average daily load - not the peak.

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4300-14 W. Montrose Ave. - Chicago 41, Ill.
Manufacturers of Ice Builders - Ice Builder Cabinets - Ice Banks

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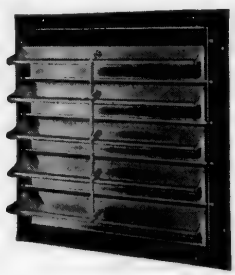

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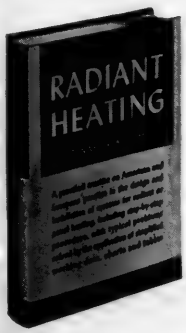
FOR THE MOST UP TO DATE MATERIAL ON

RADIANT HEATING



All you need to know about the design and installation of all types of radiant heating systems.

Step-by-step procedure, general information, design formulas and working data combine to give you the facts you need in designing and installing effective systems. All formulas have been reduced to the simplest terms. Typical problems are solved by the application of the easy-to-use charts and tables—without calculation.

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Here's brand new application information on hundreds of uses of Chromalox Electric Heating Equipment for winter weather problems. These factual reports provide you with a rich source of ideas tailored strictly to winter heating problems in and around the plant and office.

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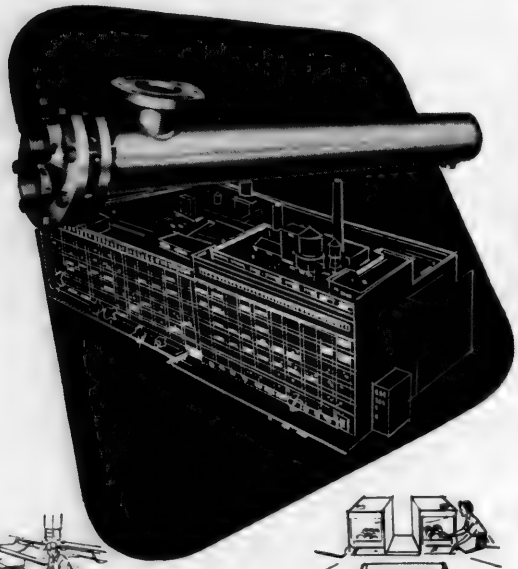
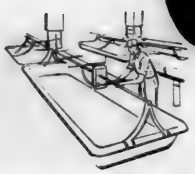
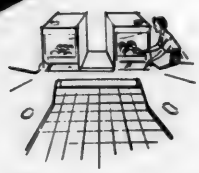




Plenty of 140° F hot water is always available at Schrader Valve, supplied by dependable Taco Instantaneous Heaters.



180° F hot water is supplied Schrader's cafeteria where approximately 2,000 employees are served daily.

Here's how Schrader Valve Company does it!

They use 5 Taco Instantaneous Heaters. Every day of the year these 5 Tacos heat 100,000 gallons of water with 5 lb. live steam to 140° or 180°F. All Schrader hot water requirements . . . and there are *many* . . . are amply met by rugged, trouble-free Tacos *without a major repair in 18 years.*

Proof that you can depend on Taco to solve your hot water problem quickly, efficiently and economically. Mail coupon for Simplified Selection Chart today.

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342 Madison Ave., N.Y. 17, N.Y. • 4 Gilead Place, Toronto 2, Can.

BETTER HEATING — Taco — BETTER WITH TACO

Send Simplified Selection Chart to:

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BOOK REVIEWS

Publications abstracted in this department should be ordered direct from publisher

HOFFMAN DATA BOOK

Data for the heating engineer, presented in simplified form, are contained in the 1957 edition of the Hoffman Data Book, compiled by Ferdinand Jehle. This is the sixth edition of a book that was first published in 1923.

The objective in preparing this pocket size volume was the presentation of reliable data on heating in simplified form. Included are a large number of tables and piping diagrams.

The material has been divided into seven sections as follows: Definitions, abbreviations and symbols; building heat loss calculations; heating systems; controls; domestic hot water systems; basic design and functioning of heating specialties and their use; piping and engineering data.

Hoffman Data Book, by F. Jehle. Flexible cover, 3¾ x 6¾ inches. Published by Hoffman Specialty Mfg. Corp., 1700 W. 10th St., Indianapolis 7, Ind. For price, write to publisher.

SOLAR RADIATION IN AIR CONDITIONING

Intended for the engineer and architect, Solar Radiation in Air Conditioning, by Ivor S. Groundwater, presents the factors that affect the intensity of solar radiation, and the amount of solar heat that eventually finds its way inside a structure.

The first part of this book deals with the source of solar design data and the development of building absorption coefficients. Several methods of calculation for heat gain are presented. Answers obtained by the various methods of calculation are tabulated for ease of comparison with the installed refrigerating effect.

Some of the chapters cover intensity of the sun's rays; direct solar radiation; indirect, diffuse or sky radiation; amount of direct solar radiation absorbed and reflected by various building materials; methods adopted to reduce sun loads; calculating the sun load; specification of the plant; Mackay and Wright method of calculation; latent load; calculations; actual performance data.

Solar Radiation in Air Conditioning, by I. S. Groundwater. Cloth Bound 5½ x 8½ inches, 125 pages. Published by Crosby Lockwood & Son, Ltd., England. Distributed in the United States by John de Graff, Inc., 13 E. 10th St., New York 3, N. Y. Price, $5.

BUILDINGS FOR INDUSTRY

Seventy-four examples of successful industrial architecture are presented in Buildings for Industry, prepared by the editors of Architectural Record. These examples are taken from all over the United States and several other countries. These buildings are arranged in the categories of warehouses, light industry, consumer goods, manufacturing laboratories, utilities and service industries, and heavy industry.

Each of the building designs is analyzed in detail to

show how it meets the practical needs and the policies of the company, and to present the outstanding features of the design.

The first section of the book covers design principles and discusses in detail problems in industrial buildings. It shows how solutions have been developed by outstanding architects and engineers. This book has reproductions of over 500 photographs and 200 line illustrations.

Buildings for Industry, by editors of Architectural Record. Cloth bound, 8¾ x 11½ inches, 390 pages. Published by F. W. Dodge Corp., 119 W. 40th St., New York 18, N. Y. Price, $9.75.

• • •

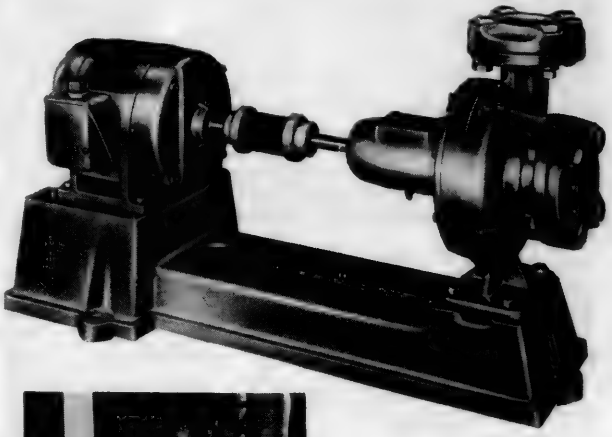
DRAFTING STANDARDS MANUAL—Five sections, each bound separately, have been prepared as the American Drafting Standards Manual and are published by The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. The sponsors of these standards are ASME and the American Society of Engineering Education. Section 1 covers Size and Format, price $1; Section 2 covers Line Conventions, Sectioning and Lettering, price, $1.50; Section 3 is on Pictorial Drawing, price $1.50; Section 5 is on Dimensioning and Notes, price for the Manual, $2.

UNITARY AIR CONDITIONING EQUIPMENT—A new standard, 210-57, covering unitary air conditioning equipment, has been issued by the Air-conditioning and Refrigeration Institute, with the cooperation of the National Warm Air Heating and Air-Conditioning Association. The standards apply to factory-made residential, commercial and industrial air conditioners or matched assemblies. Air-conditioning and Refrigeration Institute, 1346 Connecticut Ave., N.W., Washington 6, D.C. Price, 35 cents.

SCREW THREAD STANDARDS—Prepared to promote uniformity in screw thread standards in the various federal departments, Screw-thread Standards for Federal Services, 1957, Part 1, has been issued as a handbook. It is based on the work of the Interdepartmental Screw Thread Committee sponsored by the Departments of Defense, Army, Navy, Air Force, and Commerce. It also contains standards approved by ASA. Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Price, $1.25.

AIR-COOLERS FOR REFRIGERATION—ARI Standard 420-57, has been issued by the Air-conditioning and Refrigeration Institute on Forced Circulation, Free-delivery, Air-coolers for Refrigeration. The standards were prepared by the Engineering Committee of Sub-section *A* of ARI Heat Transfer Section. The standards cover the minimum equipment which shall be included in this type of cooler, methods of rating and testing, and connection sizes and markings. Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N.W., Washington 6, D.C. Price, 50 cents.

TACO MP SERIES PUMP



For quiet, vibrationless operation and rugged dependability on large installations

Designed specifically for heating and cooling systems requiring quiet, smooth operation, the new Taco MP series pump offers a host of outstanding features:

- Water-tight, self-adjusting, self-lubricated mechanical seals.
- A motor selected for quiet operation, equipped with oil lubricated, bronze sleeve bearings.
- A spring drive coupling which easily absorbs starting torque and designed for quiet operation.
- A long-life impeller shaft of stainless steel, hardened and ground to a mirror finish.
- Bronze bearings in bracket, separated by a thrust collar attached to the shaft, absorb all end thrust.
- An oil bath circulating system with modern slinger rings, lifts oil to both bronze bearings.
- Bearing bracket, impeller and shaft are completely removable without disturbing motor, volute or piping connections.
- A closed type impeller of bronze or cast iron, dynamically balanced for smooth noiseless operation and designed to eliminate hydraulic thrust.
- Volute on body legs bolted directly to the base prevent piping strains from changing pump alignment.
- A base of cast iron designed with a three-point floor mounting to simplify leveling. Provision is also made to fill with concrete for sound deadening.

For the features that mean a better performance for every large hot water heating or cooling system, put the new Taco MP series pump on the job!

Better Heating — Taco — Better with Taco

TACO HEATERS INCORPORATED

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you want 'em? we got 'em!

28 FULL LINES!

d-h AIR CONDITIONING

SPOTAIRE ROOM-by-ROOM AIR CONDITIONERS: #1 d-h LRC's: basic unit, concealed or deluxe cabinet; 4 models, 200 thru 600 cfm. #2 d-h VRC's: concealed or deluxe consoles; 3 models. 200 thru 600 cfm. #3 d-h HRC's: 3 suspended types, 19 models, 300 thru 1750 cfm.

AIR HANDLING UNITS: #4 d-h HH Series: ceiling suspended. #5 d-h HHV Series: floor mounted. Both: 14 models, 624 thru 28000 cfm.

VENTILATING UNITS: #6 d-h AM: 1752 thru 32250 cfm.

MULTIZONE TYPES: #7 d-h FLEXAZONE: for simultaneous, independent, variable heating, cooling, ventilating; 1752 thru 32250 cfm.

PACKAGED AIR CONDITIONERS: #8 d-h AECR: with built-in evaporative condenser. #9 d-h SCR: with water-cooled condenser. Both, 7½ thru 75 H.P.

PACKAGED STORE COOLERS: #10 d-h DYNA-PAC & ROYALAIRE: 2 thru 15 tons.

PACKAGED WATER CHILLERS: #11 d-h CWG: 7½ thru 75 H.P. #12 d-h CWG-E: attached evaporative condenser. Both 7½ thru 75 H.P.

EVAPORATIVE CONDENSERS: #13 d-h PERMA-FAN: 13 models; 5 thru 110 tons.

COILS: #14 Extended surface; steam, water, DX #15 Type "H"; small applications, DX or chilled water.

PACKAGED WATER CHILLERS: #16 d-h AC; air cooled. #17 d-h WC: water cooled. Both, 2, 3, 5 H.P.

COOLING TOWERS: #18 d-h WMT: 13 models, 5 thru 100 tons.

AIR-COOLED CONDENSERS: #19 d-h ACC: 5 models, 2 thru 20 tons.

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[illegible] d-h FLOCOLD (FT & CT; [illegible] & CRAFT); 9 models; 1314 to 37325 [illegible] SPASAVER: fit to

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Design of Traps

(Continued from page 70)

should be at least 10 psi and elevation of return line cannot exceed 2 ft for each pound of differential across the trap. Pipe from equipment should be as short as possible. To assure constant prime, pressure should be fairly constant in the line; the differential across the trap at least 10 psi; and the condensate at least 40 lb. per hour."

To the quoted paragraphs can be added that inlet and differential pressures should be sufficient to overcome all resistances and any back pressure in the return, that the bucket trap often insures maximum temperature within process equipment, as usually desired, and that because the condensate is not cooled before discharge, no costly cooling leg will be required as perhaps with a thermostatic trap draining process equipment. With either type of trap, it is important that steam leakage and overhot condensate be minimized to reduce the size of vacuum pump required.

The bucket type of trap was originally designed for high pressure steam service and in this connection it is interesting to note the difference in air quantities vented from high pressure versus low pressure steam mains. Initially, there is less air content in high pressure steam mains used solely for heating, not alone because pipes are smaller, but also due to the initial air in the line, which, when steam is turned on, is compressed to a small percentage of its original volume. For example, for gage pressures of 2, 5, 30, 50, 100, 150 and 250 psi, the percentage is 87, 75, 33, 23, 13, 9 and 6, respectively. Still it must not be forgotten that some high pressure steam mains, where the boiler plant is used also for process steam, may contain a considerable amount of air due to air liberated from make-up water.

Canadian Degree-Days for November, 1957*

City	November		Cumulative	
	1957	Normal**	1957	Normal**
Calgary, Alta.	1031	1110	2339	2230
Charlottetown, P. E. I.	768	850	1507	1640
Crescent Valley, B. C.	996	990	2018	2000
Edmonton, Alta.	1064	1220	2294	2410
Fort William, Ont.	1130	1170	2252	2280
Grande Prairie, Alta.	1062	1300	2437	2550
Halifax, N. S.	620	745	1218	1404
London, Ont.	812	840	1551	1480
Medicine Hat, Alta.	964	1070	2056	1970
Moncton, N. B.	816	910	1630	1760
Montreal, P. Q.	785	910	1443	1650
North Bay, Ont.	972	1080	1979	2070
Ottawa, Ont.	838	970	1578	1750
Penticton, B. C.	835	820	1577	1540
Prince George, B. C.	980	1110	2242	2320
Quebec City, P. Q.	893	990	1758	1930
Regina, Sask.	1222	1290	2503	2410
St. John, N. B.	776	880	1592	1830
Saskatoon, Sask.	1182	1320	2427	2460
Timmins, Ont.	1131	1270	2339	2460
Toronto, Ont.	711	777	1309	1396
Vancouver, B. C.	669	650	1302	1310
Victoria, B. C.	614	600	1232	1240
Windsor, Ont.	730	780	1337	1310
Winnipeg, Man.	1201	1255	2226	2252

* These data are supplied through the courtesy of the Meteorological Division Air Service Branch, Department of Transport, Canada.

** New normal figures covering 30-year period, 1921 to 1950.

The Department reports slight revision in the figure for October, as published in last month's issue. Corrected figure is: Victoria, B. C. 454.

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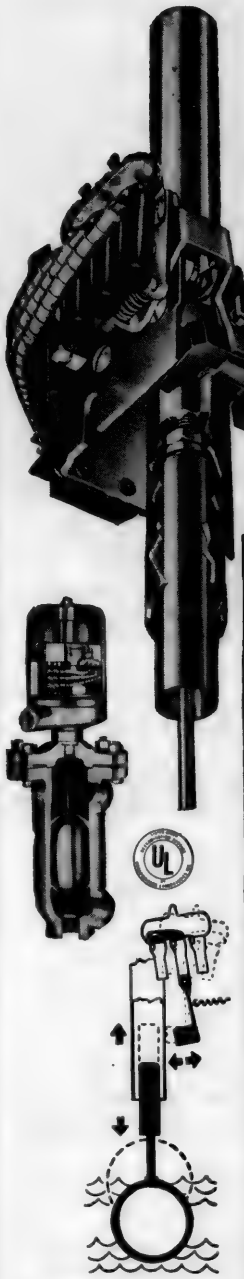

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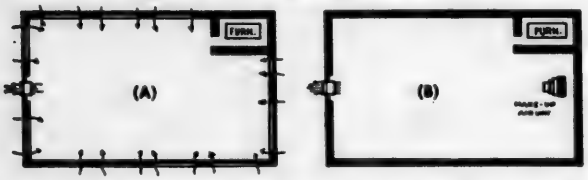

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COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

OHI MEETING—Sixth annual Dealer-Management Conference of the Oil Heat Institute of America, Inc., at the Hotel Pfister, Milwaukee, Wis. OHI News Bureau, 914 No. Charles St., Baltimore 1, Md. ..... **JANUARY 15, 1958.**

OHI COMMERCIAL AND INDUSTRIAL MEETING—Combined manufacturer and accessory commercial and industrial sections meeting of the Oil Heat Institute of America, Inc., at the Pfister Hotel, Milwaukee, Wis. C. H. Pesterfield, secretary of the Institute, 500 Fifth Ave., New York 36, N. Y. ..... **JANUARY 16, 1958.**

HOME BUILDERS EXPOSITION—14th annual convention-exposition of the National Association of Home Builders of the United States, at the Conrad Hilton and Sherman hotels, and the Chicago Coliseum, Chicago. Secretary of the Association, 111 W. Jackson Blv'd., Chicago 4, Ill. ..... **JANUARY 19-23, 1958.**

ASHAE WINTER MEETING — 64th annual meeting, American Society of Heating and Air-Conditioning Engineers at the Penn Sheraton Hotel, Pittsburgh, Pa. A. V. Hutchinson, secretary ASHAE, 62 Worth St., New York, N. Y. ..... **JANUARY 27-29, 1958.**

METEOROLOGICAL MEETING—163rd National Meeting of the American Meteorological Society, including the 38th annual business meeting, at the Barbizon-Plaza Hotel, New York, N. Y. K. C. Spengler, executive secretary of the Society, 3 Joy St., Boston 8, Mass. ..... **JANUARY 27-30, 1958.**

INDUSTRIAL VENTILATION CONFERENCE—7th annual Industrial Ventilation Conference, sponsored by the Michigan Department of Health, and the Department of Mechanical Engineering and Continuing Education Service of Michigan State University to be held at Kellogg Center, Michigan State University. Chairman of the Conference, Continuing Education Service, Michigan State University, East Lansing, Mich. ..... **FEBRUARY 17-20, 1958.**

NACE CONFERENCE—14th annual conference of the National Association of Corrosion Engineers, at the Civic Auditorium, San Francisco, Calif. A. B. Campbell, executive secretary of the Association, 1061 M & M Bldg., Houston 2, Texas. **MARCH 17-21, 1958.**

NUCLEAR CONGRESS—1958 Nuclear Engineering and Science Conference in Chicago, Ill. Engineers Joint Council, 29 W. 39th St., New York 18, N. Y. ..... **MARCH 17-21, 1958.**

POWER CONFERENCE—20th anniversary meeting of the American Power Conference, at the Hotel Sherman, Chicago, Ill. R. A. Budenholzer, mechanical engineering department, Illinois Institute of Technology, 3300 Federal St., Chicago 16, Ill. ..**MARCH 26-28, 1958.**

GAMA MEETING—Annual meeting of the Gas Appliance Manufacturer's Association, at The Greenbrier, White Sulphur Springs, W. Va. Secretary of the Association, 60 E. 42nd St., New York 17, N. Y. ..... **MARCH 31-APRIL 2, 1958.**

AIR-CONDITIONING AND REFRIGERATION MEETING—Annual meeting of the Air-Conditioning and Refrigeration Institute, at The Homestead, Hot Springs, Va. Secretary of the Institute, 1346 Connecticut Ave., N.W., Washington 6, D. C. ..... **MAY 4-7, 1958.**

MECHANICAL CONTRACTORS CONVENTION—69th annual Convention of the Mechanical Contractors Association of America, Inc., at the Ambassador Hotel, Los Angeles, Calif. L. B. Gruman, executive secretary of the Association, Suite 570, 45 Rockefeller Plaza, New York 20, N. Y. ..... **MAY 20-23, 1958.**

NDHA CONVENTION—49th annual meeting of the National District Heating Association, at the French Lick-Sheraton, French Lick, Inc., J. F. Collins, Jr., secretary of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. ..... **JUNE 2-6, 1958.**

ASTM MEETING—Annual meeting of the American Society for Testing Materials, at the Hotel Statler, Boston, Mass. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..**JUNE 22-27, 1958.**

JOINT ASHAE-ASRE MEETING—Joint summer meeting, American Society of Heating and Air-Conditioning Engineers and American Society of Refrigerating Engineers. Hotel Leamington, Minneapolis, Minn. A. V. Hutchinson, secretary of the ASHAE, 62 Worth St., New York 13, N. Y., and Secretary of the ASRE, 234 Fifth Ave., New York 1, N. Y. ..... **JUNE 23-25, 1958.**

EXPOSITION AND ASHAE CONVENTION—65th annual meeting, American Society of Heating and Air-Conditioning Engineers (Jan. 26-29, 1959) and 14th International Heating and Air Conditioning Exposition, Philadelphia, Pa. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. ..**JANUARY 26-30, 1959.**

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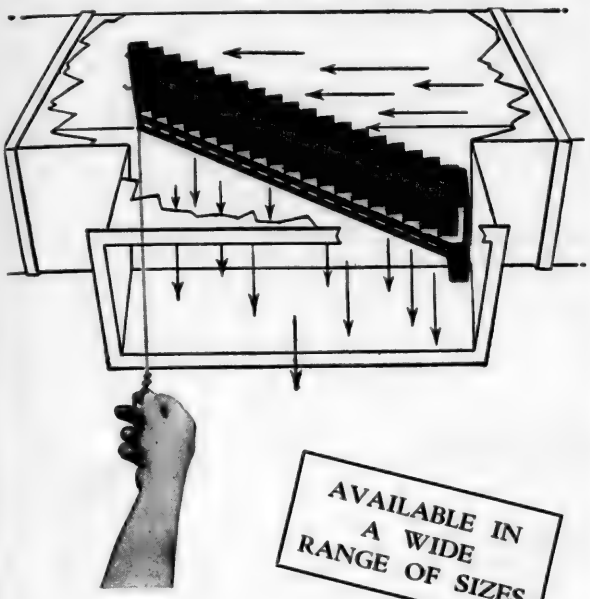

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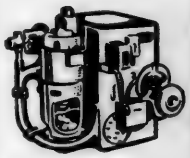

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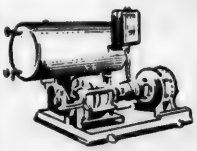

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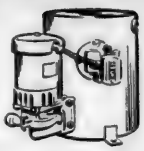

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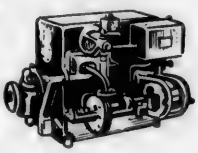

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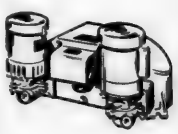

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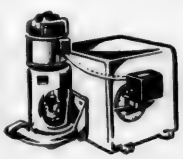

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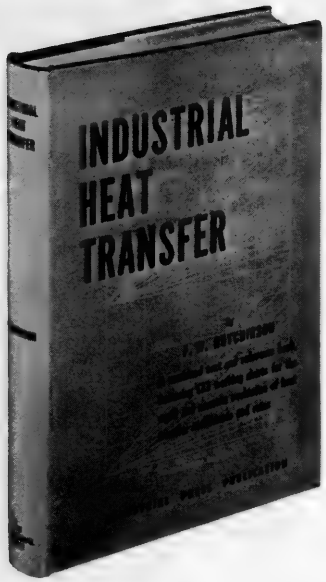

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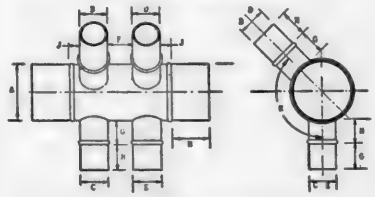

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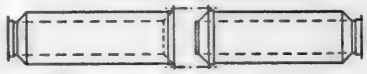

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We took a tip from a typist

The question came up at a Heads-of-Departments meeting. Production told Personnel that his new typist asked that a portion of her salary be set aside for U. S. Savings Bonds. Could it be arranged?

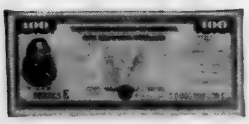
This one question posed another: How many more employees, like the typist, would like to buy Savings Bonds automatically through Payroll Savings, yet, were not aware that we've had a Plan for years?

Finding out was simple.

A phone call brought the assistance of our State Savings Bond Director. He helped plan a company-wide campaign, and provided all the materials to inform our people about the advantages of U. S. Savings Bonds. Everyone received an application card.

The upshot? Employee participation shot up to the highest percentage since the mid-Forties. And the whole program was conducted in good order. Work was never interrupted.

Today there are more Payroll savers than ever before in peace time. Look up your State Director in the phone book or write: Savings Bonds Division, U. S. Treasury Dept., Washington, D. C.



AIR CONDITIONING, HEATING & VENTILATING

THE U. S. GOVERNMENT DOES NOT PAY FOR THIS ADVERTISEMENT. THE TREASURY DEPARTMENT THANKS, FOR THEIR PATRIOTISM, THE ADVERTISING COUNCIL AND THE DONOR ABOVE.

AND PRODUCT INFORMATION SERVICE

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement. NOTE: All advertisements are digested here except those received too late for inclusion. The Index of Advertisers lists all the advertisements in this issue.

Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.

PRESSURE REGULATORS..... for steam and air service, and pressure reducing valves for water service are described in two folders, available from this manufacturer.
Inside Front Cover — Item 200

STEAM HUMIDIFIERS..... give large humidifying capacity at low cost by discharging clean, dry steam directly into room atmosphere or into air stream in ducts or plenums. Control is by accurate humidistats. Sixteen-page bulletin is available.
Page 1 — Item 201

BASEBOARD RADIATION ..... in a slimmer, more stylish model, ideal for wall-to-wall carpeting, is of all-snap construction for low installation cost. Information is available.
Page 2 — Item 202

AIR FLOW CONTROLLER..... for high velocity, double duct systems provides positive, constant volume control, eliminates costly manual balancing and is designed for leading makes of mixing units. Details are available.
Page 5 — Item 203

MULTIPLE ALUMINUM INSULATION. scientifically designed, drastically retards heat loss from buildings in winter and heat flow inward in summer. Condensation is also minimized. Booklet is available.
Page 7 — Item 204

WROUGHT IRON PIPE ..... adds pipe permanence to new Fireman's Fund Insurance Building in San Francisco for air conditioning, underground steam lines, steam condensate lines, and underground gas lines. Information is available.
Page 9 — Item 205

DIAPHRAGM TYPE FLUSH VALVES... provide a future of faultless service for a manufacturing unit of the General Telephone System, one of the largest industrial buildings in the Midwest. Information is available.
Page 11 — Item 206

Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

AIR OUTLETS ..... amounting to 3729 of the company's grilles, registers and diffusers were shipped in an average of four days' time for a major remodeling job on a 34-story building in New York City. Reason: 99% were standard warehouse sizes. Information is available.
Page 13 — Item 207

HEAVY DUTY FANS..... provide the big performance required by present day air handling problems because of their adaptability to an extremely wide variety of design requirements over a broad range of application. Bulletins are available.
Page 15 — Item 208

UNIT HEATERS AND FANS..... are only a part of a line of air heating, cooling and moving equipment manufactured by this company. A selection of bulletins is available.
Page 17 — Item 209

OVERHEAD GAS UNIT HEATERS..... have patented sealed combustion system using 100% outside air for combustion and removing combustion products outside under positive pressure. Especially applicable in restaurants and food marts. Descriptive literature offered.
Page 18 — Item 210

COOLING TOWER LINE..... is extended by the addition of 80 and 100-ton capacity cooling towers. Features include increased corrosion resistance and very quiet operation. Details are available.
Page 20 — Item 211

ALL-AIR HIGH VELOCITY SYSTEMS, for new school building or old school renovation are described in company's new school catalog which contains all necessary application and selection data.
Page 21 — Item 212

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
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244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265

PLEASE PRINT — Jan. H-58

This service available only to U.S. and Canadian readers.

Name .....

Title or Job Function .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....**Zone** ....**State** .....

This card is void after April 1, 1958

Ad-Digest

ELECTRIC HUMIDIFIERS ..... are designed to provide capacity for practically any size requirements, automatically introducing water vapor, removing up to 70% of all bacteria in the air stream. Information is available.
Page 22 Item 213

U-BOLT GATE VALVES..... have dollar saving features including identification plate, self-centering packing gland, extra deep stuffing box, liberal diaphragm clearance, full length pipe threads, and extra-wide gage, reversible wedge. Bulletin is available.
Page 23 Item 214

AIR CONDITIONING UNITS..... had to meet severe size limitations with Macy's new Roosevelt Field, L. I. suburban store. Equipment having required capacity was located in plenum area between roof and ceiling. Information is available.
Page 24 Item 215

EXPANSION JOINT ..... has an improved one-piece design of body and gland and an improved method of packing which provide new maintenance economies and greater operating efficiency. Bulletin is available.
Page 25 Item 216

PERFECT AIR DIFFUSION..... for the new Harry S. Truman Library in Independence, Mo. is insured by draftless air diffusers. Selection manual is available.
Page 26 Item 217

PERFECT AIR DIFFUSION ..... in the Harry S. Truman Library is further promoted by quality designed return air grilles. Descriptive catalog is available.
Page 26 Item 218

HIGH TEMPERATURE WATER ..... system used directly in a No. 6 fuel oil heater, without danger of system contamination, is Idea No. 2 from this manufacturer. Additional information is available.
Page 27 Item 219

REFRIGERATING UNITS ..... for any cooling needs including cool air, drinking water, ice, or refrigeration for processing in any commercial or industrial size are available from the manufacturer. Data are obtainable.
Page 28 Item 220

SNAP-ON PIPE INSULATION..... was installed in the new air conditioning systems of the Conrad Hilton Hotel in Chicago. Eighteen miles of the glass fiber insulation, in one-piece sections, was selected for economy, fast installation, and thermal properties. Information is available.
Page 29 Item 221

AIR HEATING AND MOVING..... requirements are met by one source and one responsibility for every factory heating and ventilating need. Matched equipment is designed and built to work together. Information is available.
Pages 30-31 Item 222

MAINTENANCE-FREE STEEL PIPE... for radiant heating installations is available from this company. Uniform ductability, lengths, threading, weldability, wall thickness, strength, toughness, roundness and straightness are reasons why you should specify.
Page 32 Item 223

INDUSTRIAL UNIT HEATERS ..... are designed to provide optimum Btu output, air capacity and versatility for industrial applications. Catalog is available.
Page 33 Item 224

AXIAL FLOW FANS..... are the perfect solution to many space problems. Duct size, they hug walls and ceilings, and conserve productive space. Bulletin is available.
Page 34 Item 225

125 AIR CONDITIONERS..... from this company provide year-round comfort for Houston's new Herman Drive apartment building. Each apartment has its own unit varying from 2½ to 7 tons. Information on complete line is available.
Page 35 Item 226

QUIET, DEPENDABLE BLOWERS ..... require a minimum of installation space. Mounting costs are reduced by these units which are wholly built by the company, including the motor. Three bulletins available.
Page 36 Item 227

INDIVIDUAL ROOM HEATING..... is possible in every type of building or home at a cost comparable to that of many steam or hot water systems which do not make each room a separate heating zone. Information is available.
Page 37 Item 228

AIR HANDLING EQUIPMENT..... throughout the vast Dallas Memorial Auditorium was assigned to the manufacturer's equipment including air conditioning units, sprayed coil units, giant system fans, and ventilating sets. Information is available.
Page 38 Item 229

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U. S.

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 36, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING
93 WORTH STREET
NEW YORK 13, N. Y.

AD-DIGEST SERVICE

GATE, GLOBE AND CHECK VALVES.. from this manufacturer are used exclusively on the new House of Seagram in New York City. Information on complete valve line is available.
Page 89 Item 230

WELDING FITTINGS, FLANGES ..... and valves are described in the manufacturer's reference guide which provides a fast, accurate method of ordering welding piping components from one source of supply.
Page 91 Item 231

UNIT HEATERS..... to meet any exacting heat requirement are designed and manufactured by this company. Steam, hot water, or gas-fired unit heaters last longer, cost less to install. Catalog is available.
Page 93 Item 232

VANEAXIAL FANS..... are used in American Airline's overhaul depot to supply technicians working inside airplanes with proper air circulation. Bulletin is available.
Page 95 Item 233

AUTOMATIC CONTROL PACKAGE..... specifically designed for controlling combination hot and chilled water unit ventilators provides precise control system for room and discharge temperatures in today's modern classrooms. Data sheet is available.
Page 97 Item 234

FIBER GLASS FILTERS..... are designed for safety without sacrificing strength. Chipboard grille eliminates cuts and scratches. Information is available.
Page 99 Item 235

HEAVY DUTY INDUCTION MOTOR.... combines high starting torque for quick, easy startings with low starting current and minimum light flicker. It has a constant high operating speed, and flat efficiency curve. Bulletin is available.
Page 101 Item 236

CENTRAL STATION UNITS..... air condition large projects more efficiently and at less cost due to company's method of factory assembly. Data are available.
Page 103 Item 237

PNEUMATIC CONTROL SYSTEM..... for Murchison Tower, new home of the First National Bank of Denver, includes control center which gives visual supervision of the high velocity year-round air conditioning system. Information is available.
Page 105 Item 238

HEATING PUMPS..... meet unusual and exacting conditions, offering custom design at a standard price. Pumps are inexpensive to install, operate and maintain. Bulletin is available.
Page 107 Item 239

INDUSTRIAL VENTILATION..... problems are solved in efficient manner by complete line, certified performance, and competitive pricing of manufacturer's air moving equipment. Catalog is available.
Page 108 Item 240

STEEL PIPE..... amounting to more than 376 tons was used in the heating and air conditioning systems of New York City's Coliseum. Information is available.
Page 109 Item 241

HEAVY DUTY BOILERS..... for every steam or water heating application up to 1.8 million Btu per hr output are found in this manufacturer's line. Information is available.
Page 110 Item 242

DIRECT READING VELOMETER..... measures actual air delivery. Simple, direct reading gives instant measurement in any distribution system. Device is portable, easy to understand and to use. Bulletin is available.
Page 111 Item 243

FLEXIBLE DUCT CONNECTORS..... of any type are easily fabricated from handy 25, 50, or 100-ft rolls, available from the manufacturer. Catalog is available.
Page 111 Item 244

LEAKPROOF UNION FITTINGS..... cut costs because they are easy and fast to install, they stay tight and they last longer because their two bronze seats are precision ground to a true ball joint. Information is available.
Page 112 Item 245

DEPENDABLE WATER SYSTEMS..... build contractor reputations through customer satisfaction when the manufacturer's economical and trouble free pumps are specified and installed. Catalog is available.
Page 113 Item 246

SECTIONAL DUCT FURNACES..... free the designer from the limitations imposed by packaged heating equipment. A heating or heating-cooling system designed around a duct furnace can be matched to exact job requirements. Information is available.
Page 114 Item 247

Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

INQUIRY CARD

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PLEASE PRINT Jan. H-58

This service available only to U.S. and Canadian readers.

Name .....

Title or Job Function .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....**Zone** ....**State** .....

This card is void after April 1, 1958

Ad-Digest

MOTORIZED VALVE..... thermostatically controlled for zoned heating replaces conventional radiator valves without plumbing changes in steam and hot water systems. Information is available.
Page 1115 Item 248

HUMIDITY CONTROL..... provides more effective air conditioning because cooling and heating functions are made separate from adding or taking away of moisture. Two bulletins which describe system are available.
Page 115 Item 249

FLEXIBLE HOSE ..... is adaptable for all kinds of fume and dust control and ventilation uses. It is durable, lightweight, and easy to install. Information is available.
Page 116 Item 250

INDICATORS AND RECORDERS..... as well as controlling instruments for temperature pressure and humidity requirements are described in a series of five catalogs available from this company.
Page 116 Item 251

HIGH VELOCITY AIR FILTERS..... feature high efficiency, minimum resistance, no direct air passage and large dust holding capacity. Catalog is available.
Page 117 Item 252

AIRBORNE NOISE SILENCERS..... have been designed specifically to reduce the airborne noise generated by fans in industrial air conditioning and ventilating systems. They are compact, light weight and acoustically efficient. Literature is available.
Page 118 Item 253

ICE BANKS ..... are designed by this manufacturer to deliver tons of 32 to 34-deg F ice water for recirculation through air cooling coils in air conditioning systems. Designed for use with Freon, methyl chloride, or ammonia, the banks may be added to existing systems for increased capacity. Information is available.
Page 119 Item 254

AUTOMATIC SHUTTER..... is the most substantial building shutter on the market. The only one with an angle-iron frame, it is noted for durability and long life. Catalog is available.
Page 119 Item 255

ELECTRIC HEATING..... application data for winter weather problems are given in a book offered by this manufacturer. Factual reports give solutions to problems on room heating, snow melting, de-icing, or warming materials.
Page 119 Item 256

AIR CONDITIONING EQUIPMENT..... in twenty-eight full lines is itemized in advertisement. Includes room air conditioners, air handling units, multi-zone types, packaged water chillers, coils, and cooling towers. Selection of bulletins offered.
Page 122 Item 257

CONTINUOUS STRIP DIFFUSERS..... are the only practical means for air curtaining plate glass windows or wall areas to counteract summer heat or winter chill that blends with interior. Can be hidden in lighting coves. Information available.
Page 123 Item 258

AIR MAKE-UP UNITS..... designed to supply ample quantities of clean, pre-heated air aid in maintaining peak fan performance, reducing drafts, and stabilizing uniform heating loads. Bulletin is available.
Page 124 Item 259

CONDENSATE PUMPS..... are built to give a lifetime of service with only routine maintenance. Specially designed mechanical seals eliminate stuffing boxes, frequent adjustment. Information is available.
Page 125 Item 260

SPIRAL PIPE AND FITTINGS..... and sound absorbers are custom made to cut costs and quicken accurate estimates for high velocity air movement systems. Catalog shows detailed specifications and applications.
Page 127 Item 261

FILTER-DRIER ..... incorporates an activated ceramic desiccant block for micronic filtration with granular desicant for high efficiency drying at low pressure drop. Information is available.
Inside Back Cover Item 262

PUMP AND MAKE-UP CONTROLS..... from this company take the worries and troubles out of water level and feed pump control for medium pressure boilers. Installation data are available.
Back Cover Item 263

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U. S.

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 52, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING

93 WORTH STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE

AN ENTIRELY NEW DESIGN
BRASS END CONNECTIONS—EASIER TO SEAL
HIGH WORKING PRESSURE—500 PSI
OH BOY! MICRONIC FILTRATION TOO
LOOK! GRANULAR DESICCANT TOO
CERAMIC FIRED DESICCANT BLOCK
LOOK AT THAT TRANSVERSE FLOW
ABSO-DRY PRESSURE SEALED "THEY HISS & TELL"
NO FOOLING, LESS PRESSURE DROP
ABSO-DRY® PRESSURE SEALED DRIER
HENRY VALVE CO.
CONTROLLING FLOW

"DRI-COR"...

a New Name—a Finer Filter-Drier

■ You can expect the best from Henry. Here's the new "Dri-Cor" Filter-Drier. It incorporates an activated ceramic desiccant block for micronic filtration in combination with granular desiccant for high efficiency drying with low pressure drop. Drying and filtering are properly proportioned.

Like other Henry Driers the "Dri-Cor" is thoroughly reactivated and pressure sealed at the factory, through the exclusive patented Henry Abso-Dry process.

This assures maximum drying efficiency at the time of installation. See this new type Filter-Drier at the show. It is definitely a "must" for those who demand the best.

HENRY VALVE CO.

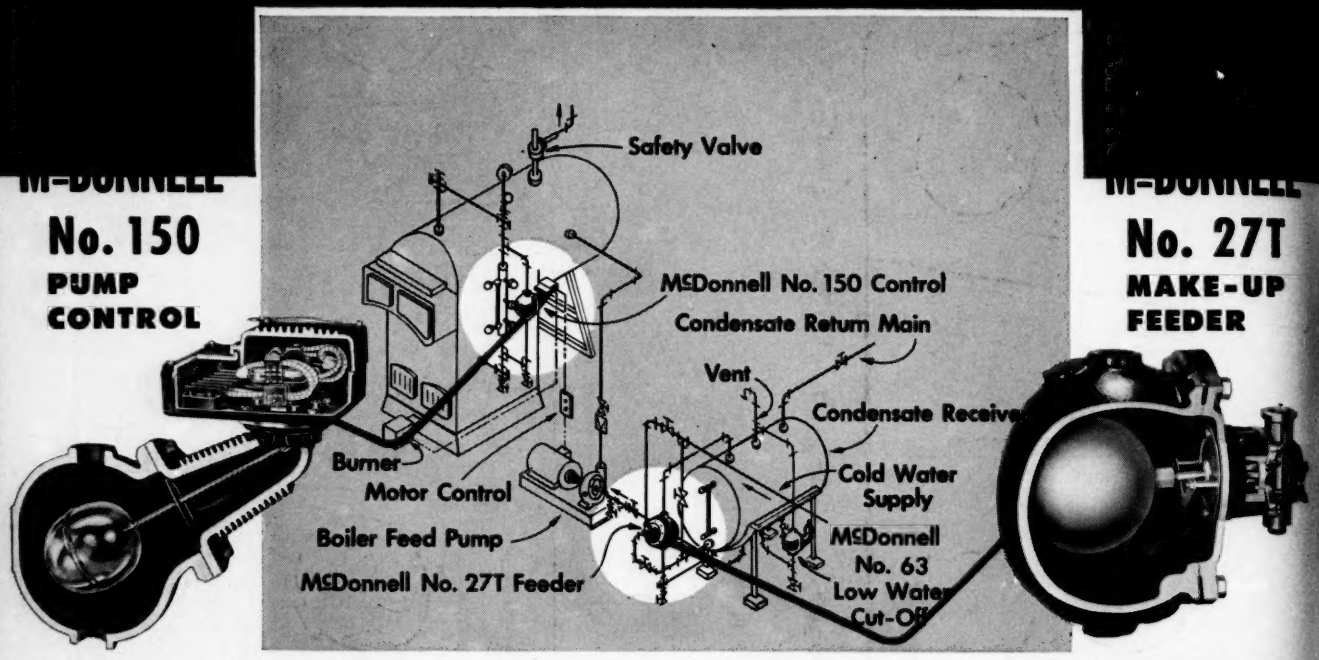
MELROSE PARK, ILLINOIS (Chicago Suburb)

Cable: Hevalco, Melrose Park, Illinois

VALVES, DRIERS, STRAINERS, AND ACCESSORIES FOR REFRIGERATION, AIR CONDITIONING, AND INDUSTRIAL APPLICATIONS

LISTED BY UNDERWRITERS' LABORATORIES, INC. UNDER RE-EXAMINATION SERVICE FOR MAXIMUM WORKING PRESSURE OF 500 PSI

Here's the GREAT COMBINATION for those Medium Pressure Boilers



No. 150
PUMP CONTROL

No. 27T
MAKE-UP FEEDER

Pump Control, Low-Water Fuel Cut-off and Low Water Alarm

The No. 150 has two mercury switches. One provides a circuit for starting and stopping feed pump; the other has circuits for low-water cut-off of the burner and for low-water alarm bell if desired. Underwriters' listed.

It is built throughout to stand up under pressure and temperature encountered in boilers of any type or size; maximum steam pressure, 150 lbs. It has no stuffing boxes to cause trouble. Packless construction is provided by extra-heavy monel sylphon bellows. Switch leads have heat-impervious, porcelain-bead insulation. Mechanism is sealed to guard against tampering. Thousands of installations attest the dependability of this control.

How to use them . . .

This is the team of thoroughbreds that takes all the worries and troubles out of water level and feed pump control for medium pressure boilers—boilers with steam pressures up to 150 psi.

The drawing above shows the simple hook-up. The No. 150 controls the boiler feed pump directly from the boiler water level. This holds the boiler water level within close limits that assures maximum steaming efficiency and fuel economy. Any deficiency in the returns is at once replaced by the No. 27T Make-up Water Feeder on the receiver.

An extra switch on the No. 150 provides circuits for cutting off burner and sounding low water alarm in the event of some emergency such as current interruption in the pump circuit or failure of make-up water supply.

Yes, this set-up gives you close control of the water level and maximum protection from low water. Ask for simple installation and wiring diagrams.

Float-operated make-up water feeder for receiving tanks

The No. 27T is particularly suited for the task of maintaining the minimum water level required in condensate receiving tanks.

With a large water feeding capacity, it is capable of meeting any sudden demands of make-up water required by the boiler and the process system. The ample capacity further allows the No. 27T to be mounted at a relatively low point on the receiving tank. This provides adequate space for the return condensate, and prevents wasteful overflow. Its sturdy design and rugged construction enables it to withstand the unusually turbulent conditions often prevalent in the receiving tank. For tank pressures to 35 lbs., water supply pressures to 100 lbs. Other McDonnell Make-up Feeders, including flange-mounted types, available for almost all needs.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One MM *Thing Well*

Your Jobber Stocks Them

McDONNELL